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The Greater Dublin Area: Ireland's Potential City-State of the Early 21st. Century

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THE GREATER DUBLIN AREA – IRELAND'S POTENTIAL CITY-STATE OF THE EARLY 21ST CENTURY

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ABSTRACT

THE GREATER DUBLIN AREA – IRELAND'S EMERGING CITY-STATE OF THE EARLY 21ST CENTURY

Dublin's superior population and employment growth, its scale size and unique urban agglomerative momentum will result in it emerging as Ireland's 'city state' by mid-to-late 21st century. The hypothesis states that by then, the GDA is expected to be approaching half of the State's population. The pivotal research question addressed is: can the GDA long-term differential population growth to that of the RoS area result in a 50% convergence of their respective populations and if so, when might this occur? The thesis develops the Hughes Years Matrix of Convergence 'HYMOC'[1] mathematical model, which represents this author's spreadsheet matrix time indicator in years, to such convergence. This includes varying population parameters of differential exponential compound annual growth rates, from scenarios of demographic-specific start-points: ones which can accommodate select assumptions as to the GDA and RoS population sizes.

From published CSO 2006 census data on town size, specifically it is the evidence of an emerging Dublin's urban plateau, one that is swelling the growth of Ireland's largest residentially-dominated towns. In combination with the capital's emerging polycentric super-suburbs, together, they are creating an urban base that is unmatched in scale anywhere else in the State. Should this long-term demographic trend continue, it is likely that the GDA will consolidate its current signs of developing as Ireland's city-state. That analogy, together with the range of mainly demographic tables, case studies and supporting data, are drawn together by way of synthesis, conclusions and recommendations for consideration by strategy planners and policy-makers. The thesis concludes that in the absence of a political will to recognise cities or to provide State-wide city-focused governance mechanisms, Dublin will continue to develop as a highly monocentric settlement – particularly for employment, and its imperious, primate growth de facto, will emerge as Ireland's city-state of the 21st century.

[1] Hughes Years Matrix of Convergence which is introduced and developed in Chapter 3, *infra*.

DECLARATION

I hereby certify that this material which I now submit for assessment on the programme of study leading to the award of Doctor of Philosophy, is entirely my own work and has not been taken from the work of others save and to the extent that such work has been cited and acknowledged within the text of my work.

Signed:_____ Date:_____8th September 2010.

Brian Patrick Hughes

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DEDICATION

To my wife Sue who keeps me on the straight and narrow. To daughters Gillian and Sinead and son Keith for their invaluable advice and technical assistance in bringing the thesis to a successful conclusion.

To the three Saint Josephs whose intercessions have created the motivation to undertake and complete this work.

Joseph The Worker
Josemaria Escriva
Joseph of Cupertino

AMDG, 2010

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INDEX OF ACRONYMS AND ABBREVIATIONS

ABD	Anywhere but Dublin
ABP	An Bord Pleanala, the Planning Appeals Authority
APOCC	All-Party Oireachtas Cttee. of the Constitution [Parliamentary Cttee.]
APS	Advanced Producer Services
ATM	Athlone-Tullamore-Mullingar Gateway under the NSS
BLM	Bettystown-Laytown-Mornington
BMA	Belfast Metropolitan Area
BRD	Balanced Regional Development
BRF	Bid Rent Function
CA	Centripetal Agglomeration
CS	Centrifugal Sprawl
CBD	Central Business District
CPG	Components of Population Growth
CRUBE	Consultancy and Research Centre for the Built Environment
CSO	Central Statistics Office
DBC	Dublin-Belfast Corridor
DCC	Dublin Chamber of Commerce
DDA	Dublin Docklands Authority
DIT	Dublin Institute of Technology
DLR	Dun Laoghaire Rathdown
DoEHLG	Department of Environment Heritage and Local Government
ESDP	European Spatial Development Perspective
ESRI	Economic and Social Research Institute
FDI	Foreign Direct Investment
FIUS	Forum for Irish Urban Studies
FUR	Functional Urban Region
GaWC	Globalisation and World Cities (Study Group and Network)
GDA	Greater Dublin Area
GDP	Gross Domestic Product
GEMACA	Group for European Metropolitan Areas Comparative Analysis
GMA	Gravity Mass and Attraction
GNP	Gross National Product
GVA	Gross Value Added
HYMOC	Hughes Years Matrix of Convergence
IBEC	Irish Business Employers Confederation
ICI	Immigrant Council of Ireland
IFSC	International Financial Services Centre
IMF	International Monetary Fund
IPA	Institute of Public Administration
IT&C	Information Technology and Communication
JOC	Joint Oireachtas Committee
LE	Local Enterprise
MCR	Mega-City Region
MNC	Multi-National Corporation
MPC	Marginal Propensity to Consume
MTR	Medium Term Review (ESRI, various)
NAMA	National Asset Management Agency

NEG	New Economic Geography
NESC	National Economic and Social Council
NG	Natural Growth (births *less* deaths)
NIRSA	National Institute for Regional Spatial Analysis (NUI, Maynooth)
NISRA	Northern Ireland Statistics and Research Agency
NSS	National Spatial Strategy
NUTS	Nomenclature of Territorial Units
OMV	Open Market Value
PAYE	Pay As You Earn
PPSN	Personal Public Service Number
QNHS	Quarterly National Household Survey (CSO)
RICS	Royal Institution of Chartered Surveyors
RoI	Republic of Ireland
RoS	Rest of State
RUDM	Rural to Urban Demographic Momentum
SCS	Society of Chartered Surveyors
SoI	Sphere of Influence
SIRC	Services Industry Research Centre (UCD)
TD	Teachta Dála [Member of Parliament]
TFR	Total Fertility Rate
UA	Urban Agglomeration
UCG	University College Galway
UCD	University College Dublin

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CHAPTER 1: INTRODUCTION

Introduction

This section introduces the basis for thesis. It consists of the following sub-sections:

1.1 Aim

The thesis explores and evaluates the possibility that the Greater Dublin Area (GDA) may become a 'Citistate' by mid to late 21st century, evolving from Ireland's current emerging dominant city region (Peirce, 1993). The concept of a citistate relates to an unrivalled region of one or more historic central cities surrounded by cities and towns which have a shared identification, functioning as a single zone for trade, commerce and communication, and are characterized by social, economic and environmental interdependence (*ibid*).[2]

The aim of this thesis therefore is to examine if a continuation of the GDA long-term superior population growth compared to that of the Rest of State (RoS) area would result in eventual convergence of their respective population totals and if so, over what time-scale might this occur and what are its policy implications for infrastructure provision, investment and economic activity? The significance of such convergence is of an already-emerging GDA city region with its urban base that is unmatched in scale anywhere else in the State. Accordingly, the thesis also measures and contrasts the historic comparative size and growth of the state's two largest settlements, Dublin and Cork, their spheres of influence (SoI) and the dynamics of their historic size

[2] **Citi•state:** See also Appendix 1 and http://citistates.com/whatis/.

differential, the scale-size considerations and contextually, as a basis for evaluating their future comparative size prospects for convergence or for further population divergence.

The relevance of this research is timed with Ireland's deep and potentially prolonged economic crisis and the consequent need to have regard to critical policy issues including a discussion on the mode of future governance. This thesis is focused on analysing both current and future demographic and spatial trajectories emerging from such decision-making.

Since 2002, the National Spatial Strategy (NSS) has endeavoured to address the contrasting socio-economic geography of a growing population in most parts of Ireland whilst showing increasing evidence of concentration in the eastern portion of the state, reflecting FDI location preference, employment, housing, the provision of infrastructure and the growth of exports in internationally traded services. Such concentration of employment together with the growth concentration in satellite towns challenges the NSS thrust for balanced regional development in implementing the policy of the European Spatial Development Perspective (ESDP), whilst reflecting the counter-strategy spatial policy advantages of centripetal agglomeration as postulated by the World Bank (Zoellick, 2009).

Within the GDA itself, the recent higher population growth rate of the Mid-East when compared with the Dublin region raises issues of density, sustainability and morphology. Should the fast-developing dormitory towns with limited employment opportunities be promoted with consequent long-term implications for long-distance commuting requirements? This contrasts with a near static growth in Dun Laoghaire-Rathdown (DLR) resulting from its significant population deflection. Related analysis draws demographic comparisons, as between Dublin's 'western towns' and the state's embryo cities. The functional role of such towns and other Dublin edge cities or 'super-suburbs' is compared with its fast-growing dormitory towns. The thesis addresses the prospect of the continuation of centripetal growth patterns: will it be replaced by agglomeration-driven centrifugal densification? These and related issues are examined further in Section 1.3.

1.2 Objectives

There are a number of related research objectives that are associated with the principal research question:

- To evaluate the role of urban hierarchy and urban scale as drivers of future demographic and economic development.
- To develop an appropriate multi-factorial robust mathematical model that will allow for a time-based prediction of when the GDA population convergence might occur.
- To examine the significant urban agglomeration in achieving competitiveness in the context of globalisation.
- To examine the potential future consequences for public policy direction in spatial planning arising from alternative projected growth scenarios.
- To consider a city-focused regional strategic policy of centripetal agglomeration or 'lumpiness'[3] as an alternative to the current NSS policy of balanced regional development.
- To formulate scenarios of future convergence upon which the specific thesis research, i.e. HYMOC model can be applied, thereby assessing possible or probable long-term population outcomes. It is left to future research to decide the normative question: is it in Ireland's best interest that Dublin should become its 21st century city state?]
- To consider the issues confronting public policy including scale, urban hierarchy, the new economic geography (NEG) and future possible scenarios of growth. In terms of the thesis hypothesis, to consider the pivotal research question: likely consequences of such convergence for the GDA and when?

This thesis focuses on the demographic issues. It adopts the 'positive' – analysing what has happened, and is what may happen demographically - rather than pursuing a 'normative' economic criterion. Dublin, as Ireland's capital continues to dominate as many important governmental, commercial and modern industrial functions are located there, making it an attractive location for many private services (Morgenroth, 2001: 64). That agglomerative attraction is self-reinforcing, especially because of the absence of

[3] 'lumpiness' is the term used in Zoellick (2009) to describe centripetal agglomeration. Policy-wise, it is the opposite to balanced regional development (BRD).

other large centres of population in the GDA and likewise due to there being no intermediate-sized cities in the RoS area. This issue will be examined empirically.

The adopted 'positive' approach for this thesis research requires demographic verification to be undertaken. Research after Henderson (2000) confirms that an economy can suffer if excess primacy results in over-concentrating on the primate city, thereby retarding the growth of a country's secondary cities.

Policy strategy might address the dual objectives of improving Dublin's 'league table' position as a metropolitan city region (NESC, 2008: *vide* Figure 6.3), whilst at the same time concentrating the RoS area growth into a small number of settlements that could attain critical mass commensurate with the increasing threshold minimum size requirement for a services-dominated knowledge based economy. As world population is projected to expand[4], this provides Ireland with policy opportunities to address the potential to take advantage of scale economics in a knowledge-based and globalising economy.

This thesis is intended as a contribution to the national and international debate as to the appropriate policy direction for spatial and economic-related development. Its timing coincides with the recognition and acceptance of the new economic geography (NEG) with its understanding of optimality from the core-periphery dynamic and in enhancing the understanding of urban agglomeration. Likewise, it is intended to clarify the direction of policy in a way that fosters and achieves competitiveness. Accordingly, the research of the thesis is intended to contribute to the public policy debate related to the thrust and direction of Ireland's future physical development with these central objectives.

1.3 Historical Context of the Research and Thesis Time Baseline

The contextual setting for Ireland's economic history commences around the late 1950s, which saw a major strategic change in direction by government, moving from a previous policy strategy of insular self-reliance to the embracement of foreign direct investment (FDI) and leading to today's world position as the third most globalised

[4] The United Nations Population Division predicts that by mid twenty-first century it will be in the nine to ten billion range.

economy (OECD, 2009). At that time Ireland's economy was predominantly agricultural. Then its dominant export and principal source of foreign earnings, agriculture, suffered from unfavourable British pricing resulting from that country's cheap-food policy (O'Muireheartaig (Ed.), 2008). Early in that decade manufacturing output represented just a single figure percentage of export growth and protectionist policies prevailed.

Foreign Direct Investment (FDI) was statutorily constrained, consistent with Ireland's protectionist economic policy. Post-war US-funded Marshall Aid was confined to few projects reflecting a neutral war-time stance. Much of the limited capital spending was focused on infrastructure and social projects rather than on productive activity. With its small population and non-agricultural sector the country was unable to capture the economies of scale associated with extensive production runs. Industry manufacturing was also handicapped by a pressing need for modernisation and adaptation. The 'home market' advantage was missing (O'Muireheartaig, 2008, *op. cit*).

Both the Industrial Development Authority (IDA) and the Export Board were established together with supportive statutory foundation: the Underdeveloped Areas Act of 1952 and the Industrial Grants Act of 1956. Thus important fiscal stimuli were provided including the industrial grants system and tax rebates on export profits. Despite these initiatives, during the late 1950s the state was enduring its deepest economic recession triggered by another balance-of-payments crisis. Economic stagnation, high unemployment and record emigration coincided with the lowest ever state population recorded in the 1961 census.

As the 1950s progressed, there was increasing recognition that manufacturing-led export growth could enhance the balance of trade, generating much needed employment and raise the country's low standard of living. Since publication in 1958 of the landmark study *Economic Development* (O'Muireheartaig, 2008, *ibid*), Ireland commenced its forward move from an insular and introverted perspective to its present-day position as one of the world's most globalised economies. A significant policy-shift was emerging with a transformation from agricultural self-sufficiency and industrial protectionism, to recognition of the importance of becoming a trading entity.

In contrast to the previous decade, the 1960s was one of economic recovery resulting from fresh productive investment and strong manufacturing growth. By 1969 industrial exports exceeded those of agriculture for the first time (MacSharry and White, 2000). State population began to increase after 1961 and, despite one slight reversal during 1986-1991, it has grown by 58.27% by April 2009 (*vide* CSO, Volume 1, various censuses and CSO *Population and Migration Estimates*, 2009). The RoS area population growth commenced its recovery after 1966, this lagged growth providing the evidence that demographic growth invariably, is city-led.

Tables 1.1 and 1.2 below cover the aggregate 1926-2006 period. This shows the GDA's uninterrupted increase in its share of population since the first census following the foundation of the state. This is substantially attributable to the growth of Dublin. Table 1.1 covers the pre-thesis baseline census date of 1966.

Table 1.1: GDA as Percentages of RoS and of State Population (1926-1966)

Census Year	GDA Population	RoS Population	GDA as % of Rest of State	GDA as % of State population	Total State Population
1926	684,242	2,287,750	29.91%	23.02%	2,971,992
1936	764,791	2,203,629	34.71%	25.76%	2,968,420
1946	827,725	2,127,382	38.91%	28.01%	2,955,107
1951	888,386	2,072,207	42.87%	30.01%	2,960,593
1956	898,364	1,999,900	44.92%	31.00%	2,898,264
1961	906,347	1,911,994	47.40%	32.16%	2,818,341
1966	989,202	1,894,800	52.21%	34.30%	2,884,002

Source: CSO Census 2006. Analysis: Thesis author

The choice of the baseline census of 1966 for this research is made for the following reasons. First, it marked the lowest point for the RoS population, at just 1,894,800. Likewise that particular census was used as the base-year for the Buchanan Plan time projection. Coincidentally, this was also the census when the state urban population at 49.20% was converging with that of the rural total. Furthermore, it was about the time when mandatory planning was introduced, effective from October 1964, followed by the publication in 1967 of the first draft development plans to implement mandatory spatial planning strategy.

Table 1.2 hereunder details in similar layout, the seven-census outcomes for the thesis baseline to the most recent census. It is significant in the intervening forty years to 2006, that both areas of state experienced similar growth: the RoS area's increase of 682,512 having been almost matched by the 673,334 expansion in the GDA population. However, in 1966, the RoS area baseline population was 91.55% greater.

Table 1.2: GDA as Percentages of RoS and of State Population (1966-2006)

Census Year	GDA Population	RoS Population	GDA as % of Rest of State	GDA as % of State population	Total State Population
1966	989,202	1,894,800	52.21%	34.30%	2,884,002
1971	1,062,220	1,916,028	55.44%	35.67%	2,978,248
1979	1,255,533	2,112,684	59.43%	37.28%	3,368,217
1981	1,290,154	2,153,251	59.92%	37.47%	3,443,405
1986	1,336,119	2,204,524	60.61%	37.74%	3,540,643
1991	1,350,595	2,175,124	62.09%	38.31%	3,525,719
1996	1,405,671	2,220,416	63.31%	38.77%	3,626,087
2002	1,535,446	2,381,757	64.47%	39.20%	3,917,203
2006	1,662,536	2,577,312	64.51%	39.21%	4,239,848

Source: CSO Census 2006. Analysis: Thesis author

After the slow decline of the State's population up to 1961 and to 1966 in the case of the RoS area, the decade of the 1970s marked the first of two significant 'steps' of accelerated demographic growth, the second one having commenced in 1996 and sustained throughout the following decade (*vide* Figure 1.1).

Figure 1.1: Two Steps of Population Growth since the Lowest Point of 2.82 million 1961:

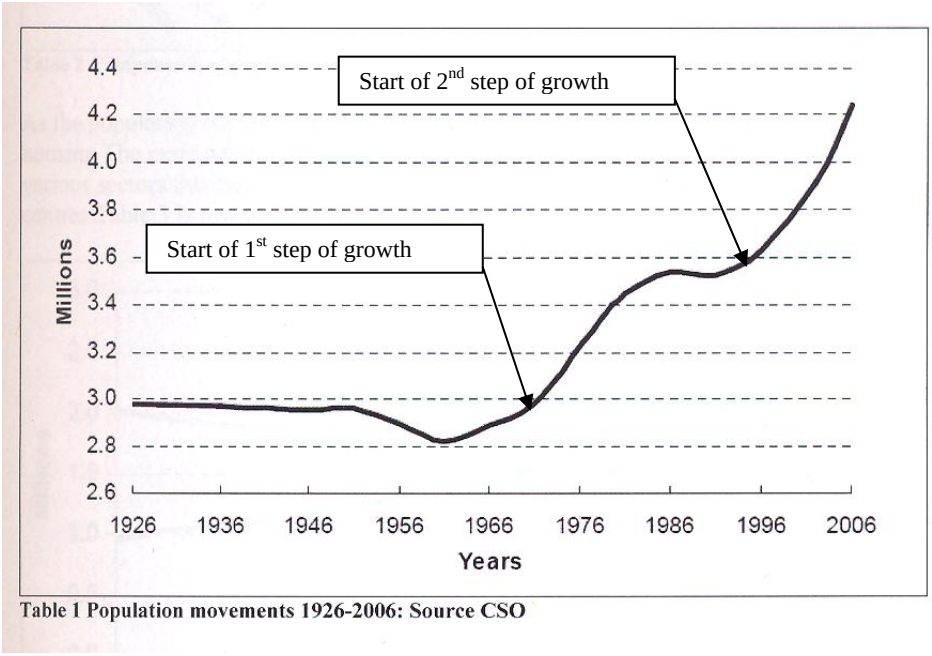


Table 1 Population movements 1926-2006: Source CSO

Source: Central Statistics Office, 2006 Principal Demographic Results.

In Figure 1.1, the arrows point to 1971 and 1996 marking the start points of the first and second 'steps' of strong population growth. Since the end date 2006 in the graph line, the second 'step' of growth has continued upwards, towards the graph's top right-hand corner. However, the most recent CSO *Population and Migration Estimates* for year to April 2009 indicates that the second 'step' has stalled at just under the 4.5 million mark. The CSO figure for state population as at that date is 4,459,300 (*Population and Migration Estimates*, 2009).

Natural growth was the main growth component to the first 'step' period, complemented by a modest rate of net in-migration throughout the 1970s. In contrast, since the 1996 census, net in-migration driven by employment demand up to 2007 gave the state its strongest period of population growth until April 2009.

In response to a request from the Irish Government, in October 1966 the United Nations commissioned Colin Buchanan and Partners to undertake two interrelated studies. One of these was to prepare a plan for the City of Galway and the other brief:

> *To undertake regional studies for seven of the nine planning regions of Ireland so as to provide a basis for recommendations to the Government concerning*

> *physical development policies for these regions. The regions concerned are: Cork-Kerry, Mayo-Galway, Sligo-Leitrim, Donegal, South-East, North-East, Midlands* (ibid.).

This became known as 'The Buchanan Plan' (1968). It proposed to accelerate the growth of Cork, Limerick-Shannon and a few of the larger settlements over 1969-1986. However, it was politically rejected because most policymakers, politicians and influential journalists eschewed the potential of 'trickle down' benefits that were intended to arise from its 'growth centre' policy. Apart from a rearguard 'centralist' counter-argument from the Department of Finance who supported the plan, the government judged it to be politically unacceptable at local level and thus it was not implemented (MacSharry and White, 2000: 299-300). Buchanan's growth-centred approach was demographically significant because its principal objective was on average, to treble Cork and Limerick's populations by 1986 and thereby achieve self-sustaining critical mass in the south and west as counter-poles to Dublin.

In its place the IDA introduced a policy of dispersed industrialisation to fill the spatial policy strategy void left by the Buchanan Plan rejection. The new industrial location guidance strategy document became the State's 1971 spatial development policy for the next twenty-five years.[5] Unfortunately, the scale-size issue in an Irish context meant that however idealistic was this strategy in spatial terms, little synergy was created and the country ended up with one-off branch plants with indiscriminate locations. This meant that a void existed in the absence of a comprehensive national spatial policy strategy is until the introduction of the NSS (2002).

This government's decision to implement this alternative, IDA-led May 1972 twenty-year 'dispersalist' policy also included a stated objective to limit Dublin's population growth to just its own natural population increase (MacSharry and White, 2000). The IDA plan achieved considerable initial success in providing new industrial employment, particularly in the west and midlands up to the end of the 1970s. Nonetheless, there was

[5] Its principal modus of implementation, as explained in launching promotions – one of which this thesis author attended in An Foras Forbartha – was to select a central county location. The cited example was Portlaoise. In its surrounding settlements, Stradbally, Abbeyleix, Mountrath, Mountmellick and Portarlington, the strategy was to locate industrial plants the objective of achieving an industrial 'dispersed cluster' synergy. The 'home' plant in Portlaoise would act as a downstream manufactory which would in turn outsource upstream sub-suppliers for servicing the main plant which would assemble the final product.

little evidence of clustering and unrelated industrial one-offs or branch-plants comprised the predominant form of industrial development. Importantly, that policy 'failed' in so far as Dublin continued to grow in scale size and particularly so when compared with populations of other principal settlements within the state.

In contrast to the period of rapid economic growth during the 1960s and its associated population growth, Dublin endured economy stagnation during the late 1970s and throughout the 1980s with the demise of much of its established 'protectionist' industrial base in an new era of free trade preceding entry into the EEC in 1971. That was followed by the after-effects of the successive first and second oil crises.

The capital was also to experience a further policy setback with the government's rejection of the Eastern Regional Development Organisation (ERDO) Plan in 1986 for the GDA. At that time, the country was enduring high unemployment and national finances were handicapped with an excessive debt-to-GDP ratio. Much of its inner city was severely run-down and new strategy initiatives were required to reposition the capital, which at that point occupied a lowly position in a European league table benchmark of city progress (McDonald, F., 1985).

Towards the end of the 1980s progressive fiscal policy coupled with the first of several social partnership agreements set the scene for substantial improvement in public finances and reductions in the debt to GDP ratio. This was complemented by the passing of innovative legislative measures, establishing Dublin's International Financial Services Centre (IFSC), the Urban Renewal Act and the Finance Act of 1986. After a series of severe budgets, the country rectified its debt-to-GDP ratio, achieving economic and fiscal stability by the early 1990s (O'Muireheartaig, 2008).

Ireland experienced its strongest and most prolonged period of economic growth commencing in 1993 and lasting until 2006 (Central Bank, 2009). Over that period the 'in employment' numbers analysis as defined in the CSO Quarterly National Household Survey (QNHS) increased by over 50%. This 'Celtic Tiger' era comprised two phases. First, a period to 2001 was characterised as one of strong export-led growth. After a short downturn following '9/11' in 2001, the second growth stage emerged and was largely 'consumer driven' by low interest rates and cash liquidity (ESRI, 2005).

By 2007, the Irish economy had become over-reliant on consumer spending, the construction industry and the property market. Irish banks experienced rapid growth in a period of liquidity supply and a lending spurt driven by their need to maintain market share. A ready access to finance was used to accelerate residential and commercial property development activity and the funding of land purchases with the prospect of zoning upgrade. Excessive asset-value growth and rising interest rates aggravated the Irish property crash coupled with a severe banking crisis over the past three years, since mid-2007 (Central Bank, 2009).

The banking difficulties have enforced the state-led capital replenishment but at the expense of a much-enlarged national debt. Accordingly, Ireland is currently experiencing a significant sovereign debt challenge and its incomplete bank restructuring will elongate its economic recovery (ESRI, 2010). Furthermore, there is renewed debate by leading first world economists as to the prospect or otherwise for a 'double-dip' recession prospect.

Thus, over the past sixty years since the 1950s, the State has progressed from one of agriculture export dominance, through a subsequent period of industrial export primacy and progressively moving towards high-value and high volume 'knowledge' services exports. This is confirmed by the fact that in 2009 'cerebral' services-led exports, for the first time, exceed the value of 'physical' exports. Increasingly dependent on its ability to trade over that timeframe, the policy has been to attract FDI companies and to develop high-value, mainly 'knowledge-based exports enforced by Ireland's small domestic market.[6] However, this type of output tends to have less employment input than the manufacturing of physical goods.

The entire island of Ireland is consolidating its population growth along the east coast and in a relatively narrow strip of adjacent land, Futures Academy *Twice the Size* (2008) and Figures 7.1 and 7.2, *infra.* Thus the state's demographic direction appears to be defying the NSS in its stated objective to achieve balanced regional development (BRD)

[6] For example, just 40% of Ireland's 2008 and 2009 traditional manufacturing output was exported in contrast with the small but dynamic indigenous services industry. The World Trade Organisation placed Ireland in ninth position in the world in absolute terms in 2009 for services exports, accounting for almost 3% of the global total. Between 2000 and 2009 services exports trebled whereas goods exports were lower. FDI companies were responsible for 88% of Irish exports in year 2008 (the latest data available*), Irish Times*, 03.08.2010, p. 14.

and projected growth of its gateways likewise is not being achieved, as confirmed in Fitzpatrick (2009). Particularly for the GDA, its population growth increasingly, replicates the alternative, US-led strategy of urban-based centripetal agglomeration as advocated in Zoellick (2009).This is further explored in section 2.1.

Having outlined the aims and objectives and thesis timeframe history of the second half of the twentieth century to the present day and thereby establishing the thesis baseline, the second part of this first chapter sets out the following definitions and key concepts. Then it is instructive to introduce author's HYMOC model. The chapter concludes with a brief introduction of 5 considerations for growth and finishes with the thesis outline for the following chapters.

1.4 Key Concepts of Thesis, Definitions and Theory

It is instructive to set out the main definitions, the related issues and the essential working concepts of the thesis which are listed together with their issues references. They are then explained or defined as appropriate hereunder. The first six items are mostly policy related and the remaining sixteen in character are mainly urban economic, demographic or new economic geography areas of theory. The Key Issues are briefly introduced in section 1.6 and are discussed at the beginning of Chapter 2:

1.4.1	Greater Dublin Area (GDA)	Key Issue 5
1.4.2	Rest of State (RoS)	Key Issue 5
1.4.3	Nomenclature of Territorial Units for Statistics (NUTS)	Key Issue 4
1.4.4	Balanced Regional Development (BRD)	Key Issue 4
1.4.5	Centripetal Agglomeration (CA)	Key Issue 5
1.4.6	Centrifugal Sprawl (CS)	Key Issue 4
1.4.7	Gravity Mass and Attraction (GMA)	Key Issue 1
1.4.8	Polycentricity	Key Issue 2
1.4.9	Scale-size Difference	Key Issue 1
1.4.10	Sphere of Influence (SoI)	Key Issue 2
1.4.11	Settlement classification	Key Issue 2
1.4.12	Citi•state	Key Issue 5
1.4.13	Zipf's Law	Key Issue 2
1.4.14	Bid Rent Function (BRF)	Key Issue 2

1.4.15 Primacy	Key Issue 1
1.4.16 Density	Key Issue 3
1.4.17 Urban Agglomeration (UA)	Key Issue 3
1.4.18 Bifurcations	Key Issue 3
1.4.19 Rural to Urban Demographic Momentum (RUDM)	Key Issue 2
1.4.20 Components of Population Growth (CPG)	Key Issue 1
1.4.21 Basis Points spread (BP)	Key Issue 1
1.4.22 Globalisation	Key Issue 1

***1.4.1 Greater Dublin Area (GDA)*:** The GDA with 6,982 square kilometres, comprising just 9.95% of the Republic's land mass (Map 1). The GDA has two components: the NUTS 3 regions of Dublin and the Mid-East (Map 1). Dublin city and county extends to 920.66 sq. km., In turn, Dublin is divided into four 'Administrative Counties' being Dublin City Borough having 117.61 sq. km., Dun Laoghaire-Rathdown with 126.95 sq. km., Fingal 453.09 and South Dublin has 223.01 square kilometres of land surface (Map 1). The Mid-East has 6,061.34 square kilometres, comprising Kildare 1,694.20, Meath 2,334.54 and Wicklow with 2,032.60 square kilometres. In all, the GDA comprises 39.21% share of State population in the April 2006 census.[7]

***1.4.2 Rest of State (RoS)*:** The RoS with 63,200 square kilometres and 90.05% of the State's surface area, had 60.79% of the population share at the April 2006 census.[8] It comprises six NUTS 3 planning regions, Border, Midlands, South-East, Mid-West, South-West and West, detailed in Table NN. It has 60.79% of the state population in the 2006 census.

[7] Ireland's largest town Drogheda presents an anomaly as it straddles the Louth and Meath county boundary. Only the smaller portion, 6,117 out of its 2006 population of 35,090 is in Meath and within the GDA.

[8.] Walsh, Clinch, and Convery (2002: 100) articulate the view that the State be divided into these two, the GDA and RoS areas *because they are the only two regions in the State***.** These authors point to the fact that the present six 'planning regions' that comprise the RoS have two serious and debilitating limitations:

- They are too small, with regional populations in the 230,000 to 580,000 range (2002).
- They have no public identity, given the prominence of the 'county' unit.

Thesis author would add another critical defect; they do not contain any ESDP-defined size city.

***1.4.3 Nomenclature of Territorial Units for Statistics (NUTS)*:** Through Eurostat the EU has classified Ireland as being a NUTS 1 region, in recognition of its scale size, alongside five other member or associated countries: the Czech Republic, Slovakia, Sweden, Norway and Switzerland.

1.4.4 Balanced Regional Development (BRD): (BRD) is the underlying policy of the national spatial strategy (NSS) is defined as *developing the full potential of each area to contribute to the optimal performance of the State as a whole – economically, socially and environmentally* (NSS 2002: 11) The way in which Ireland has grown challenges the achievability of balanced regional development (BRD) although it does not dismiss the National Spatial Strategy's (NSS) prime objective whereby regions and settlements may eventually perform to their own potential – without sacrificing the common good.

***1.4.5 Centripetal Agglomeration (CA)*:** This World Bank 2009 research confirming densely structured cities as conforming to the world-wide movement towards inward-directed urban consolidation (Zoellick, 2009). That literature points to the near-universal trend towards centripetal agglomeration as so described in its promoting the agglomeration advantages to be gained from having larger settlements. This is linked with density, and demographic mass the defining characteristic of large urban settlements. Concentrated economic activity, development and urban agglomeration are likewise associated with densification.

***1.4.6 Centrifugal Sprawl (CS)*:** The opposite growth-force concept to CA, occurs where the expansion of a large settlement is directed outward into discontiguous sprawl, often 'leapfrogging' into adjacent counties (Simmonds and Hack, 2000; Peiser, 1999). It is characterised by the US residential ambition to have ample lot sizes, of low density sub-division layout. Public-sector transport is predominantly uneconomic and land-use is often wasteful. Nevertheless, it is politically favoured at the local level because it encourages the development of agricultural land through ample, if not excessive zoning. Its major disadvantage is the encouragement of unsustainable medium and long-distance commuting, primarily through the use of the private motor car. Much of Dublin's post-1985 expansion, associated with the rejection of the ERDO Plan, has been centrifugal in character, expanding into the 'Hinterland' of the adjoining Mid East Region. Despite the Regional Planning Guidelines attempts to focus a higher proportion of growth into the

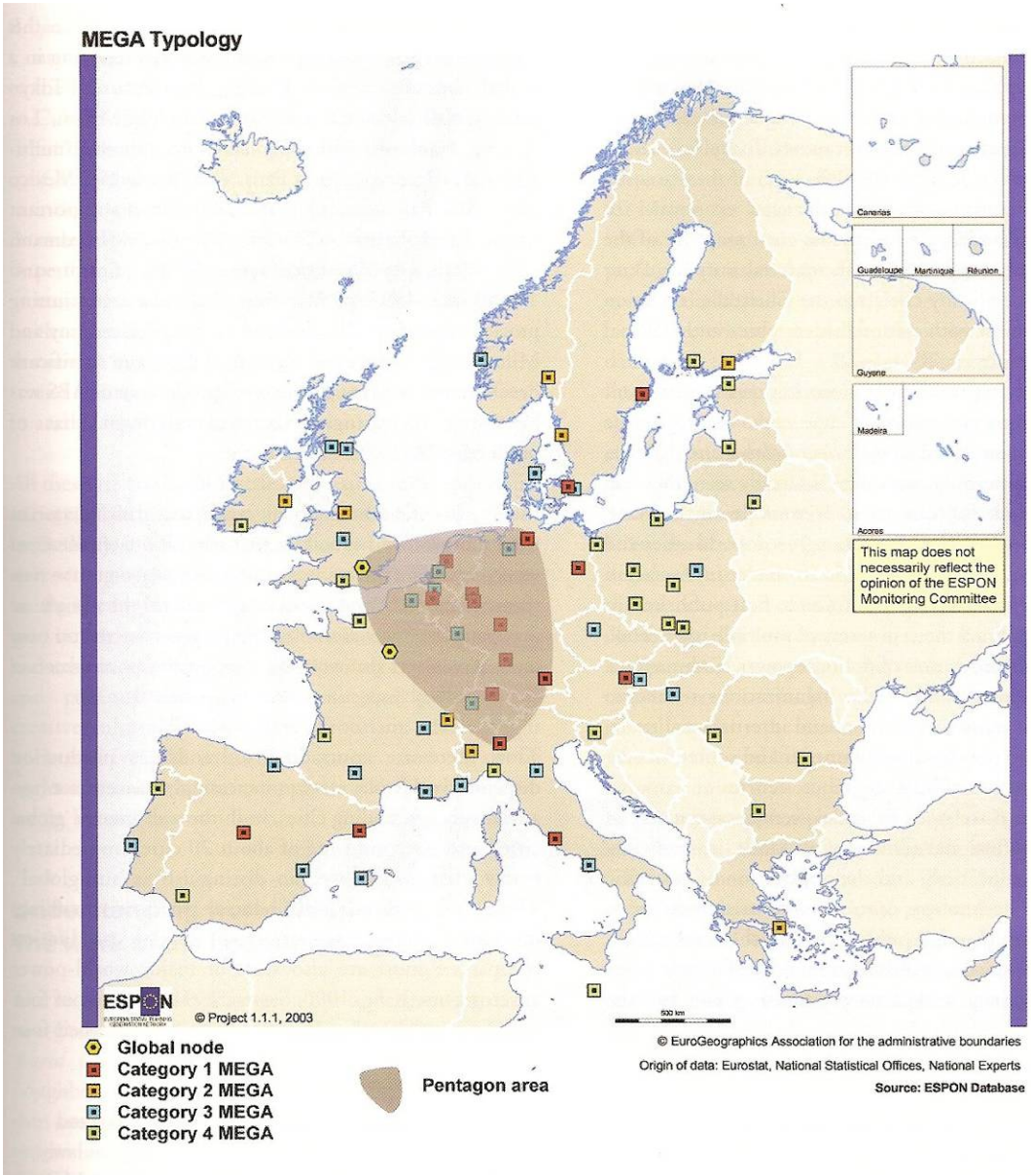
near-city ‘Metropolitan’ area, weak statutory powers up to the present have tended to be ‘directive’ rather than mandatory.

***1.4.7 Gravity Mass and Attraction (GMA)*:** The application of Newton’s Universal Law on Gravity inspired Reilly (1929, 1931) to apply its principles to the assessment of Retail Gravitation. This formulation is based on a direct relationship with distance and an inverse one with population. The application of gravity attraction to two-dimensional geographic surface areas and to urban settlement population is similar in principle to Newton’s three-dimension astronomy and to planet/star mass. The modern interpretation of distance is viewed in terms of time/transportation resource as much as, if not more so, than to physical distance. The land-use/transportation dynamic, also is influenced by this principle.

***1.4.8 Polycentricity* :** Is defined as the outward diffusion from major cities to smaller cities within mega-city regions (MCR). Outside the so-called ‘European Pentagon’ core region bounded by Birmingham, Paris, Milan, Hamburg and Amsterdam, it is the ESDP policy of promoting ‘gateway’ cities, *vide* Figure 1.2. In Dublin’s case the 2005 study region comprised the GDA plus Co. Louth, described as the ‘Greater Dublin Region’. The study identified nine large towns which, together with Dublin, are analysed for multi-location offices with advanced producer services-type (APS) firms. The measurement of employment with the stated criterion of 20,000 such jobs per location has been modified in this Irish instance to gateway centres having a 4,000 minimum. The European Pentagon is shown in Figure 1.2 below.

Future public policy is central to the pivotal question of the thesis hypothesis in the way it will influence the direction and pace of the demographic and the physical growth of the GDA. Accordingly, the content of principal policy, the Regional Planning Guidelines for the Greater Dublin Area (RPGGDA), published in July 2004 covers the 2004-2016 medium-term period. This is the most relevant instrument of GDA spatial policy. Central to its intended implementation are the six (draft) strategic Planning Goals, the second one of which is *A strategy that creates a sustainable attractive, high quality, accessible, cost effective, properly functioning region in its physical, economic, social and cultural dimensions.* This goal, as stated, will include the development of a compact polycentric settlement strategy for the GDA.

Figure 1.2: The 'European Pentagon'



Source: Hall and Pain (2006). *The Polycentric Metropolis*

***1.4.9 Scale-size Difference*:** This is an important issue for settlements and their hinterlands or for city sphere-of-influence (SoI) populations and is related to agglomeration and to threshold size. Because of historic and current population contrasts between major Irish settlements, their scale-size differences are considerable and they continue to widen as exemplified in comparing Dublin with Cork. The time dynamic of absolute population differences is the most important outcome from this aspect of demographic analysis, *vide* Appendix 8 for Medium and Long-Term Historic Demographic Analysis of the state's Two Largest Settlements - Dublin and Cork

***1.4.10 Sphere of Influence (SoI)*:** This relates to the spill-over effect from cities, most noticeable in the above-average growth in its surrounding towns. In assessing the relative importance of large settlements, it is argued in NESC 102, NESC 117 and NSS (2002) that it is not only the population size of settlements that should be considered for ranking or comparison purposes. In addition, their spheres of influence should include the rural densification within the commuting range of cities and isolated large towns.

***1.4.11 Settlement classification*:** Comprise cities, towns and the non-urban areas of open countryside or nucleated villages of less than 1,500 in population. Irish towns are divided into four categories, *vide* CSO: Table 7, Vol. 1 of census: Large of 10,000+, Medium of 5,000-9,999, Smaller of 3,000 to 4,999 and Smallest with 1,500 to 2,999. Contiguous and within the morphology of cities and containing clearly-defined central business districts (CBD) are polycentric 'super suburbs' such as Dundrum-Sandyford or the three Myles Wright planned towns of Blanchardstown, Clondalkin-Lucan and Tallaght. Free-standing towns sometimes are absorbed into an expanding city as, for example, Lucan was absorbed into Dublin in the 1970s. Sometimes, former towns, e.g. Cahirciveen = 1,649 (1966) lose population thereby losing their 'urban' status, having reduced to 1,294 (2006). The settlement strategy for the GDA is intended to be polycentric in nature, vide 1.6.8, *supra.*

***1.4.12 Citi•state*:** A region consisting of one or more historic central cities surrounded by cities and towns which have a shared identification, function as a single zone for trade, commerce and communication, and are characterized by social, economic and environmental interdependence (Peirce, 1993; http://citistates.com/whatis/. *vide* Appendix 1.) Further extracts taken from that literature were influential in the selection of the title and subject-matter of this thesis. They are contained in the literature review.

***1.4.13 Zipf's Law (1949)*:** It is appropriate to examine the State's five cities in the context of *Zipf's Law* (1949) or the *Rank-Size Rule*. *This states that the population of a city multiplied by its rank in terms of population is a constant.*[9] Applied analysis is significant in

[9] Its variant, Davis's Law is perhaps more relevant to larger countries: it postulates that groups of cities within defined size categories should aggregate to the same population – especially when viewed over a time dynamic of, say, every fifty years (Bogart, 1998: 17). Another source, Pitzl (2004), quotes the economist Mark Jefferson in defining a Primate City as one where the population ratio between it and the second and third largest cities are 100:30:20 based upon empirical observation which produces a somewhat more benign outcome.

determining the thesis finding of an absence of a second-hierarchy tier of settlement in the state.

***1.4.14 Bid Rent Function (BRF)*:** The foundation for Alonso's BRF theory, as he pointed out, had been laid by von Thunen (1826). However, it was Alonso in his 1960 paper which had 'revived' that earlier land model and then applied it to the principle of a value-to-distance relation into an urban setting. A related application of this model is used to analyse 1986-2006 growth rates of major settlement populations linked to distance from central Dublin, for some of its radial transportation corridors (*vide* Figure 4.2).

***1.4.15 Primacy*:** This is *the measure of the relationship between economic growth and the degree of urban concentration; the share of the largest metropolitan area in urban population and state population* (Henderson, 1980). That literature's empirical research confirms a high correlation coefficient of about 0.85 between a country's urbanisation and its GDP per capita. Economic development and infrastructure provision transforms a country's economy from agriculture to industry and then to a service-base and its urban concentration enhances efficiency and wealth creation.

***1.4.16 Density*:** Zoellick (2009) places emphasis on density as one of three spatial dimensions, the other two being distance and division or political borders. Density is defined as the economic mass per unit of land area. In human terms its most important measure is population per unit of land area. This is a significant issue in relation to Ireland's economies of scale due to the demographic scale-size difference of its secondary cities compared to Dublin. This impacts even more so in the diseconomies of scale for all other regions with even greater scale-size differences to the GDA.

Furthermore, city densification and close spatial concentration facilitates labour-market efficiency, reduced commuting and transportation costs, enhanced retailing, innovation job-creation and knowledge transfer. However, over-concentration can create agglomeration-diseconomies, as confirmed in Alonso (1970), particularly where infrastructure fails to keep pace with population growth and where a country's secondary cities lag behind the pace of growth of its primate settlement.

***1.4.17 Urban Agglomeration (UA)*:** UA may be described as the spatial clustering of economic activity by multi-sector profit-driven firms, into a single thickly populated 'core' region. It arises where the cumulative process of increasing returns over time results from self-reinforcing geographic concentration.

***1.4.18 Bifurcations*:** Are defined as *critical values of parameters at which the qualitative behaviour of the economy's dynamics changes* (Fujita, Krugman and Venables, 2001: 34). Through the medium of bifurcation modelling, the literature developed further detailed insights of the spatial economy, where economic activity occurs and why. Pinch (2001) states that it is the first literature to explain *the existence of large economic agglomerations at various spatial scales.*

***1.4.19 Rural to Urban Demographic Momentum*:** It is instructive to consider the pace over time at which the state population is urbanising, i.e. the proportion of population living in settlements of 1,500 or more. The definition of urban inclusion and rules applying to urban contiguity including suburbs are contained in the CSO census Volume 1, appendix 2 (2006). From Williams, Hughes and Redmond (2010a) it was established that the annual rate of rural to urban population movement is 6,200, equivalent to the 2006 population of Ballinasloe. Just 12.6% of the state's rural population was GDA-based in that census.

***1.4.20 Components of Population Growth*:** In world demography, the only component is Natural Growth (NG) as migration is endogenous with a neutral outcome. Nonetheless, the United Nations Population Division, they estimate that the current world migration is 80 million per annum, which is growing at a somewhat faster rate than the 0.9% population growth. Migratory pressures may arise from warfare or due to political strife. However, the predominant cause is economic: to migrate to more prosperous areas. Thus the overall trend is from Third to First World. The World Bank (2006) have found that 3% of the world's population live outside their country of birth but the percentage is much higher in highly developed countries, having doubled since 1970 (Poot, Waldorf and van Wissen, 2008).

***1.4.21 Basis Points Spread (BP) as Applied to the HYMOC model*:** The conventional measure of population growth is expressed exponentially. When calculated, the result is

thus expressed as 'X% growth per annum compound'. Population convergence involves the comparison of growth (or contraction) rates for any two entities such as settlements, or in the case of subject thesis, as regions: the GDA and RoS areas. Having set out the comparative data in tabular format, e.g., as presented in Table 2.1, the growth per annum compound percentage difference is obtained and is shown in its percentage format as representing the spread between the two areas. Finally, the percentage is divided by 100 and thus expressed as Basis Points (BP). The larger the BP spread, the shorter will be the time period to convergence – assuming that the less populous GDA growth rate is greater than the RoS area for the time period under consideration.

***1.4.22 Globalisation*:** Globalisation is defined as the measure of a country's economic dependence and openness to international trade and commerce. Its formal measurement is expressed as the sum of its exports plus imports divided by the country's gross domestic product (GDP).

1.5 Introduction to Author's HYMOC Model

Having described the definitions-key issues, the basis points (BP) spread concept, when taken in context with the thesis hypothesis and its central research question, it is now appropriate to briefly consider the background leading to the thesis quantitative model.

The thesis hypothesis assumes a population convergence, stating that the capital region's continuing urban agglomeration momentum will result in Dublin emerging as Ireland's city-state by mid-to-late 21st century. Accordingly the application and testing of population growth scenarios requires this model to be able to measure time-based convergence. It is titled the 'Hughes Years Matrix of Convergence', the HYMOC model.

This is a brief overview of thesis author's empirical methodology of convergence, the subject matter of Chapter 3. Thesis author's HYMOC model is based on and incorporates the *exponential characteristic* of population growth, as detailed in Morgenroth (2001, Appendix 10), *vide infra.* The principal population projection method is that of exponential extrapolation, the second of the four methods cited in that literature. The thesis model is designed to measure and compare the respective population growth or contraction curves for the GDA and RoS areas. It takes the form

of an equation, i.e., in assuming that the smaller GDA population over a certain time period converges to equal that of the RoS area. This is premised on the benefits of urban agglomeration whereby a stronger GDA population growth may 'converge' by way of faster exponential growth, in an upward graph curve that intersects with that of the RoS area during the convergence year.

1.6 Brief Introduction to Five Key Issues for Growth Scenarios

In considering Ireland as a small and open economy and also having regard to its current fiscal and monetary circumstances, it is imperative to consider the consequences arising from future policy making. Past policy making has been largely influenced by the state predominant agricultural background. The tug between respecting culture and tradition on the one hand and the economic need to raise per-capita income and to acknowledge a gradual momentum to urbanise, is set against a background imperative of economic globalisation, future competitiveness and complementarities arising for the state as a trading entity. Accordingly, future policy-making and its implementation will be confronted by major issues relating to the pivotal research question of the thesis hypothesis. These are outlined at the beginning of the next chapter.

1.7 Thesis Outline and Content of Remaining Chapters

Chapter two comprises the literature review. It is structured around the five key issues and commences with the practical-policy strand of the literature review with a summary of past and present policy measures as they relate to emerging demographic movements. It includes a review of current policy, its plan-led inconsistencies and how it differs from what is happening on the ground due to past and current market-driven forces. The policy issues are examined in the context of demographic growth dynamics, distinguishing between market-led and plan-led growth.

The thesis methodology is divided into two quantitative and one qualitative chapter. Chapter three sets out the details of the HYMOC model formulation as already described.

Chapter four is the second quantitative one. It demonstrates the model's application together with associated scenarios that are relevant to the pivotal research question.

Chapter five, the qualitative methodology chapter, details and encompasses the views of the listed interviewees.

The sixth chapter addresses and clarifies the analysis data for the five issues as they relate to the pivotal research question. The penultimate chapter synthesises the empirical and policy findings of the preceding chapters and the final chapter comprises a concluding discussion, the thesis limitations and its recommendations for further research areas.

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction to the Five Key Issues

This literature review focuses on five issues as they relate to the central research question, to a GDA population convergence with the RoS area and its prospective time frame. This layout-format first considers theoretical issues related to the thesis hypothesis and then addresses the policy issues associated with the hypothesis and its related research objectives. The collation of literature is therefore theme-based and thus is not set out in a chronological order. Because of this layout design, it was decided not to collate theory and policy separately.

The five issues are:	**Pertinence:**
1 - Imperatives of Scale	Competitiveness and Globalisation.
2 - Town size and Urban Hierarchy	As a driver of the future economy.
3 - Economic trends and spatial characteristics	As a determinant of location.
4 - Past/ present public policy and their outcome	Has influenced current morphology.
5 - Future public policy	As the determinants of future spatial-demographic outcomes

The consideration of these issues in sequence represents, *inter alia*, a defence of the role of the urban hierarchy and in particular, to the pivotal role of the GDA.

2.2 Key Issue 1 – Imperatives of Scale

In this sub-section the following literature subjects are pertinent:

2.2.1 Internal Returns to Scale and Localisation Economies
2.2.2 Economics of Urbanisation – Externalities from Technology Spill-over
2.2.3 Comparative Advantage of Location Proximity
2.2.4 Forces that Foster and Oppose Agglomeration

2.2.1 Internal Returns to Scale and Localisation Economies

The literature commences by reviewing the development of urban micro-economic theory and showing, pre-Krugman (1981) and especially Fujita (1989), how urban

economics was limited, analytically, in its approach to spatial analysis. However, demography was gradually introduced as a factor that had a recognised time-dynamic. Broadbent (1977) describes urban economics as containing and applying many of the basic concepts of modern economics. He explains how *Perloff and Wingo (1968*) describe the 'urban' versions of the two mainstreams of economic theory.

> *Urban micro-economics has been developed from von Thunen (1826), by Weber (1968), Christaller (1966), Losch (1954) and Alonso (1964). All these authors emphasise the pre-eminence of micro-competition and optimisation of costs and utility. Their work tends to result in a static picture of some end-state equilibrium pattern of activity location within the city. Some economists, e.g. Richardson (1971) regard urban economics as a very much underdeveloped branch of economics, even possibly an inferior one. There is a frank acknowledgement in some standard works (e.g., Thompson 1968a) of the inadequacy of both the neo-classical resource allocation and the Keynesian multiplier approach. Thompson (1968b) feels that the economists 'run for cover' in situations where the supply side plays a major role as it does in urban development. He reckons the conventional theory is too 'short-term,' too dependent on a single factor, transport, and even growth theory explains only the fluctuations in income and output and not the underlying, long-term determinants of growth. But there is also a great deal of controversy within economics, over what the limits of the theory really are when it is used in the urban situation* (ibid. pp.192-193).

Evans (2004: 156) reviews the discipline of Urban Economics noting that by then, it has succeeded in clarifying:

> *how urban concentration is associated with high land values, that house and property prices tend to be higher at the centre of cities than elsewhere, that employment densities are highest near the centre so journeys to work are longer. And, of course, congestion and pollution tend to be greater in larger cities.*

Belts of urbanisation were evident from the mid-20th century, particularly in North-Eastern U.S.A., the German Ruhr and the East Midlands of the U.K. (Mumford, 1963). Yet, within these morphologies there were still clearly defined city settlement units. Firms achieve significant economies of scale in their own production simply by reason of their size. Such economies of scale are regarded as being internal to the firm. Richardson (1978) describes internal returns to scale as the growth of a 'company town' that reveals a historical correlation between expansion of a plant's capacity and an increase in the town's population. Bogart (1998) points out, that internal economies of

scale are one explanation for the clustering of activity as people move close to the large production site, which leads to the relatively higher density of activity that defines a city.

Fujita et al. (1999) recognise that a common location of firms within the same industry can generate positive externalities. Bogart (1998) identifies localisation economies of scale in which firms benefit from being near related firms and highlights three sources of such economies of scale, firstly the benefit of labour pooling which includes access to specialised labour skills for firms and access to a variety of employment opportunities for workers. The second source is the benefit from developing economies of scale in intermediate inputs for a products, the third source is the greater ease of communication made possible by proximity to competitors, suppliers and clients, including the ability to pass along innovations quickly.

Henderson (1988) suggests that economies of scale in manufacturing are primarily localisation. He also finds that industries with large localisation economies of scale are ones in which cities tend to specialise. Koo (2007) reiterates this view and maintains that agglomeration of economic activities facilitates the development of localised innovation networks through which information about newly developed technologies and innovations is diffused.

Such technology spill-over reinforce the rate of technological advancement and consequently attract more firms that seek the latest information on new innovations. Well developed innovation networks and the existence of localised technology spill-over are good reasons for a firm to locate near other related firms. His research found that the importance of cluster-based specialisation increases as the knowledge intensity of an industry increases and for knowledge-intensive industries, the concentration of interconnected industries that share similar knowledge bases is critical to the localisation of such spill-over.

Rosenberg (1982) points out that innovation rarely occurs in isolation and concludes that the foundation of a successful innovation is often provided by localisation agglomeration resulting from a number of interacting technologies in related sectors.

2.2.2 Economics of Urbanisation – Externalities from Technology Spill-over

This relates to demographic, social and economic issues that are location-focused. Koo (2007) describes how Marshall (1890), Arrow (1962), and Romer (1986) all argued that externalities from technology spill-over are maximised when a local industry is specialised (often called the MAR externality). In other words, regions with specialised industry structure tend to create more externalities. Therefore, if an industry is subject to MAR externalities, firms are likely to locate in a few cities where producers of that industry are already clustered.

On the other hand, he explains that both Chintz (1961) and Jacobs (1969) believed that important knowledge transfers occur mostly across industries and valued the diversity of local industry mix, often called the Jacobs' externalities (1969). They both argued that the city is a breeding ground for new ideas and innovations because diverse industry bases in the city stimulate inter-industry knowledge transfers. The results from empirical studies are, however, according to Koo (2007) mixed. Glaeser et al. (1992) found evidence only in favour of Jacobs. In summary *urbanisation economics comes from industrial diversity that fosters innovation* (Zoellick, 2009: 131).

2.2.3 Comparative Advantage of Location Proximity

Bronzini (2007) suggests that urbanisation or diversification economies stem from the spatial concentration of firms producing different goods or services and thus represent positive externalities taking place among diverse industries. According to Jacobs (1969) this variety and complementarities of spatially proximate industries can promote the transfer of knowledge and thus stimulate productivity and growth.

Richardson (1978) suggested that urbanisation economies of scale allow many different kinds of activity to benefit from proximity to each other in terms of both backward and forward linkages using common facilities and services, joint labour pools etc. Such external economies are frequently cumulative so that once a location obtains an initial advantage, forces are at work making it larger and strengthening its competitive position *vis a vis* other locations. Evans (1985) opines that the size of the market is all important since it not only attracts firms but also increases the 'economies' available. It allows new firms to come into existence and new services to be provided because the demand is great enough in the city to support them, in that it allows them to take advantage of

possible economies of scale. Fujita et al. (1996) showed how the interaction of backward linkages and forward linkages does indeed create a positive feedback, tending to cause clustering of activity.

Bogart (1998) proposed that urbanisation economies of scale are those where firms benefit from being located in a large city, even though the activities of those firms may be unrelated. Other local firms may be able to use the advantage of proximity in order to increase their local sales to the new investment, thereby generating localised growth in the hinterland of the investment. He outlines the three possible sources of urbanisation economies of scale.

- First is the access to a larger market, which reduces the need to transport products in order to sell them.
- The second is the easy access to the wide variety of specialised services that are available in larger cities but not necessarily in smaller cities.
- The third is the potential for cross industry spill-over of knowledge and technology.

McCann (2001) details the incubator model which is associated with Chinitz (1961, 1964) who argued that industrial clusters which are highly diversified and which contain a range of different types of industries and firm sizes, will act as superior 'incubators' for the development and growth of new firms. McDonald, J (1997) notes that an urban economy with competitive and diversified industry, will grow more rapidly than one with oligopolistic and undiversified industry. Chintz (1961) also argued that a more diversified local economy will have a more diversified demand for labour.

According to Koo (2007) the first discussion on the impact of competition on innovative activity and spillovers dates back to Schumpeter (1942). He believed that the possibility of immediate imitation of a new innovation in perfect competition would discourage innovative activity because the expected return under such conditions is smaller and that innovations are promoted by larger firms under imperfect competition.

However, Jacobs (1969) and Porter (1990) argued that local competition stimulates technology imitations and transfers and therefore influence the level of local innovation and knowledge spillover. In other words local competition stimulates firms to innovate or rapidly adopt new technology and, therefore, geographical areas populated by small firms can be more dynamic. Chinitz (1961) also emphasised the role of entrepreneurs in spurring new innovations in cities. Koo (2007) suggests that recent empirical studies found that local competition is indeed an important factor for knowledge spill-over. Increasingly therefore, technology innovation is recognised as being central to the wellbeing and future prosperity of cities. It is therefore appropriate to consider how urban economic theory, assisted by demographic studies has influenced and complemented the emergence of the new economic geography (NEG). Historically, the USA and Japanese approach to the development of urban economic was mathematical, in Germany and Holland it was spatial and in the UK it was largely descriptive with a land use economics 'flavour' that has a real-estate influence.

2.2.4 Forces that Foster or Oppose Agglomeration

It is instructive to consider Fujita, Krugman and Venables (1991) summation of the conflicting forces for and against 'agglomeration' and 'spread', thus:

> *…two simple ideas, the first idea is that, in a world where increasing returns and transport costs are both important, forward and backward linkages can create a circular logic of agglomeration. That is, other things being the same, producers want to locate close to their suppliers and to their customers – which means that they want to locate close to each other. The second idea is that the immobility of some resources – land certainly, and in many cases labour – acts as a centrifugal force that opposes the centripetal force of agglomeration. And the tension between these centrifugal and centripetal forces shapes the evolution of the economy's spatial structure (ibid).*

Forces that foster and oppose agglomeration are displayed in the following Figure:

Figure 2.1: Forces Supporting and Opposing Agglomeration

Centripetal Forces (For)	**Centrifugal Forces (Against)**
• Linkages	Immobile factors
• Thick Markets	Land rent/ commuting
• Knowledge spillovers and other pure external economies	Congestion and other pure diseconomies

Source: Fujita, Krugman and Venables (2001: 346)

A pivotal question addressed in this thesis concerns convergence of the GDA population with the RoS area and when might this occur? Could it be a rapid or slow convergence, or no convergence?

Kaldor's approach stresses the importance of regional competitiveness in determining a region's economic performance. Although the current economic downturn since 2008 has yet to provide conclusive data on individual regional performance, the findings of both Kaldor (1970) and Amgeriz, et al. (2009) would point to an earlier relative economic recovery for the GDA, given its economies of scale advantage attributable to urban agglomeration. If this were so, could it in turn support a return of the 'traditional' growth path of population divergence between the GDA and the RoS area during 1966-1996.

2.3 Key Issue 2 – The Role of Urban Hierarchy

This sub-section considers the following literature areas:

2.3.1 Demography Theory

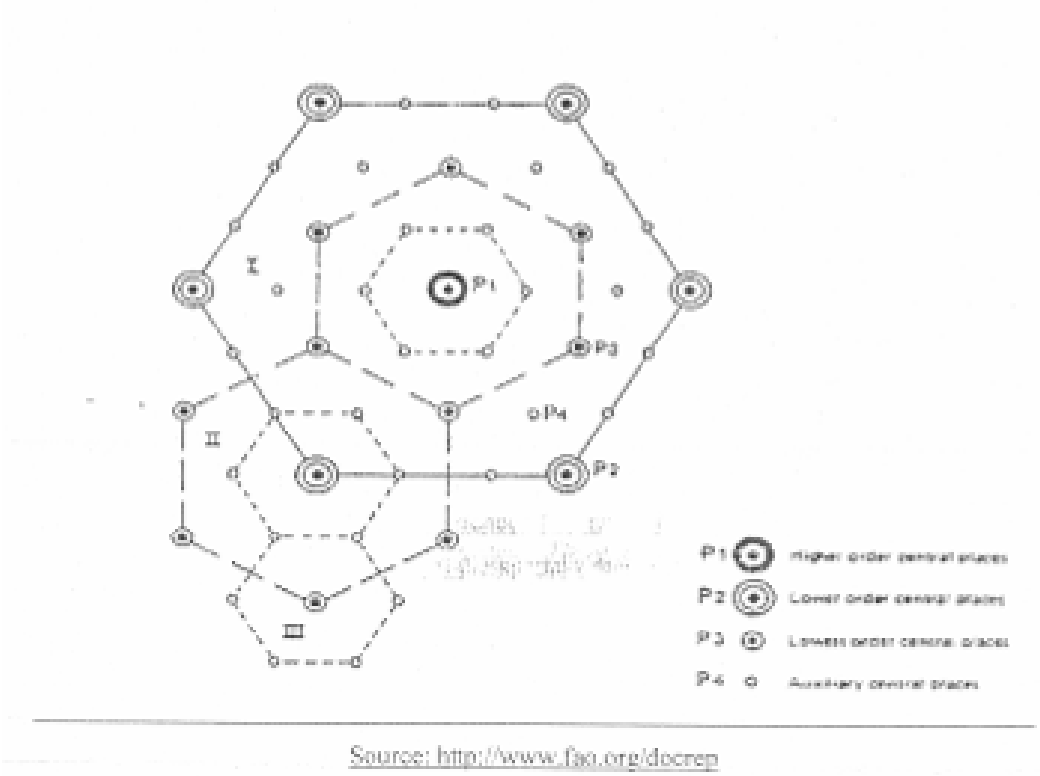
2.3.2 Overview of Factors Influencing Settlement Patterns

2.3.1 Demography Theory

In examine the literature confirming the relationship between demography and urban economics, the study of end-use demand and the location theory of land uses are both central issues. Pivotal to this is the Losch (1939) demand function coupled with transportation linkages. He was concerned with the central problem of understanding the location of economic activity in market areas and in particular the creation of economic regions. Here, the issue of density resulting from specialisation, the

demography of demand *and the operation of economies of scale would be balanced against transportation costs and the benefits of diversified production* (Carter, 1981). Losch modified and expanded the understanding of 'central places' that had been enunciated in Christaller (1933), as described in Strange (2005), *vide* Fig. 2.2, thus:

Figure 2.2: Losch's Modification of the Christaller Model



Source: http://www.fao.org/docrep

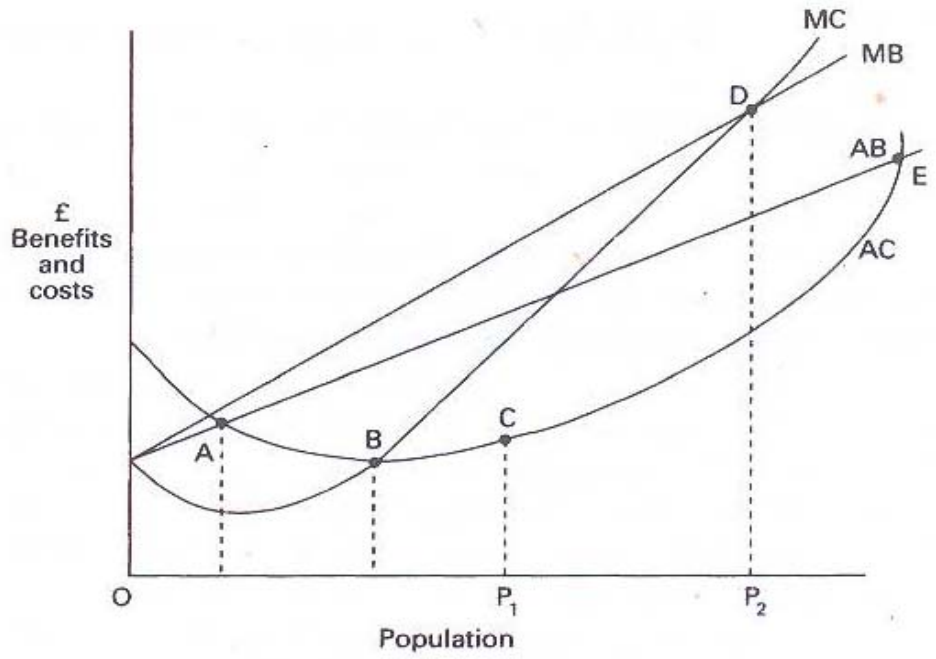
Evans (1985) suggests that Christaller's Central Place Theory provides an explanation for two urban phenomena. First it explains the existence of an urban hierarchy and secondly it explains the spatial structure of the urban system and the spatial relationship between cities of different sizes. Both Balchin et al (1995) and Knowles (1976) acknowledge the fundamental importance of Christaller's work in terms of highlighting the importance of the market area to the size of the town's population and introducing the idea of urban hierarchy.

However Balchin et al's (1995) main criticism of this theory is its dependence upon the evolution of settlements in a uniform pattern ignoring variable topography. Knowles (1976) reiterates this view and implies that the assumption of an isotropic (having the

same size or properties when measured in different locations) surface is inappropriate and suggests that the theoretical arrangement of settlements in a region will inevitably be determined by local conditions. Furthermore, Balchin et al (1995) maintain that Christaller's Central Place Theory fails to incorporate the growth of both industrial suburbs and outlying business districts.

This theoretical spatial arrangement of co-existing cities, in turn, extends the concept of urban agglomeration to transportation corridors and city clusters. In a paper to the Regional Science Association, Alonso (1971) described in micro-economic terms the demographic size of a city: its costs and values shown in the five inflection points A to F, (*vide* Figure 2.2, in Balchin, *et al*., 1995). In defining specific minimum population threshold that distinguishes a 'city', there is evidence that it occurs at a population of 100,000 - beyond Alonso's inflection point 'A' in Figure 2.3, hereunder. Likewise, it is accepted that for a cerebral as distinct from an industrial society, population thresholds for all five inflection points 'A' to 'E', continue to increase in tandem with technological advancement.

Figure 2.3: The Costs and Benefits of City Size



Source: Alonso (1971)

As shown in Balchin et al (2005: 43)
MB = Marginal Benefits
MC = Marginal Costs
AB = Average Benefits
AC = Average Costs

Consideration of the theoretical issue of city size leads to an understanding of present-day city form, its structure and its prospects. Up to the mid twentieth century growth patterns of individual cities are monocentric in nature; the city expanding outward from a recognised single central business district (Balchin *et al*, 1995). However, the second half of the last century was to mark the emergence of much larger polycentric cities resulting from successive waves of expansion, depicted by Harris and Ullman's (1951) model of 'Zone 7', identified as an 'outside business district'. Mumford (1960) addressed the future city hinting at polycentricity as indicated in the title to his celebrated text. Whilst acknowledging that clusters of nearby cities were already established, both in Europe and in the USA, his prediction of the polycentric form for an individual city was not morphologically established at that time and the literature of Garreau (1991) on identifying 'edge cities' was then still some decades into the future.

Towards the end of the last century theories, influenced by empirical research had also identified two conflicting patterns of city growth forces, centrifugal and centripetal. In the case of centrifugal, outward directed growth pressures are exerted where the factor of production 'land' is both readily available and inexpensive, very often encouraging low-density centrifugal-type sprawl, analogous to the 'all-American dream' of large gardens facilitated by the proliferation of the private motor car (Garreau, 1991).

On the other hand, and subject to acceptable building height policy, sustainable development increasingly is viewed as a centripetal force, creating a compact morphology (after Jenks, 1996). Densification, very often with this inward-directed force is adjudged as being more sustainable, primarily because population density is amenable to the economics of mass transit and in reducing home to work journey. The theoretical researches of peak-oil and rising fuel costs, environmental pollution and road congestion arising from the inefficient use of the private car, all provide persuasive arguments against dispersed city regions, favouring instead the advocacy of centripetal agglomeration strategies. In turn this promotes agglomeration economics, especially

knowledge spill-over and enterprise (Zoellick, 2009). Agglomeration Economics is defined in O'Sullivan (2009: 91) as where *physical proximity increases production through input sharing, labour policy, labour matching and knowledge spillovers.*

Furthermore, agglomeration economics are influential in the location and clustering of dynamic industries, states Morgenroth (2001: 9) In applying this line of argument to the prospective morphological form of the GDA, he describes how agglomeration economics

> … a*rise from the existence of a number of firms working in the same or related industries. Thus, these firms share a large common labour market where the required skills are more prevalent, they exchange information, they make use of the same ancillary service industries and they use a common infrastructure.*

Importantly, that literature also points to per capita economies-of-scale relationship with transportation and settlement hierarchy, with innovation, and the demography of labour, thus:

> *Agglomeration economics also exist in terms of service provision since it is easier to maximise access to public services in more densely populated areas and since the provision of many public services is subject to increasing returns to scale. This means that the cost per person of the provision for the provision of a particular public service is lower when this public service is supplied in a large town than in a small town. In general the economic literature suggests that agglomeration through high densities and close proximity and of individuals promotes information spillovers, facilitates the functioning of labour markets and reduces transportation costs both to industry and to individuals, see Ciccone and Hall (1995) and Fujita, Krugman and Venables (1999) (ibid).*

This, in turn, supports the empirical evidence that progressively, the city is the economic engine for national and regional growth and prosperity, especially when viewed from the theoretical perspective of the new economic geography (NEG). In concluding the final chapter of their celebrated literature, Fujita, Krugman and Venables (2001)[10] discussed and likewise set out the *modelling options* for and against 'agglomeration' in Figure 2.1, *supra*.

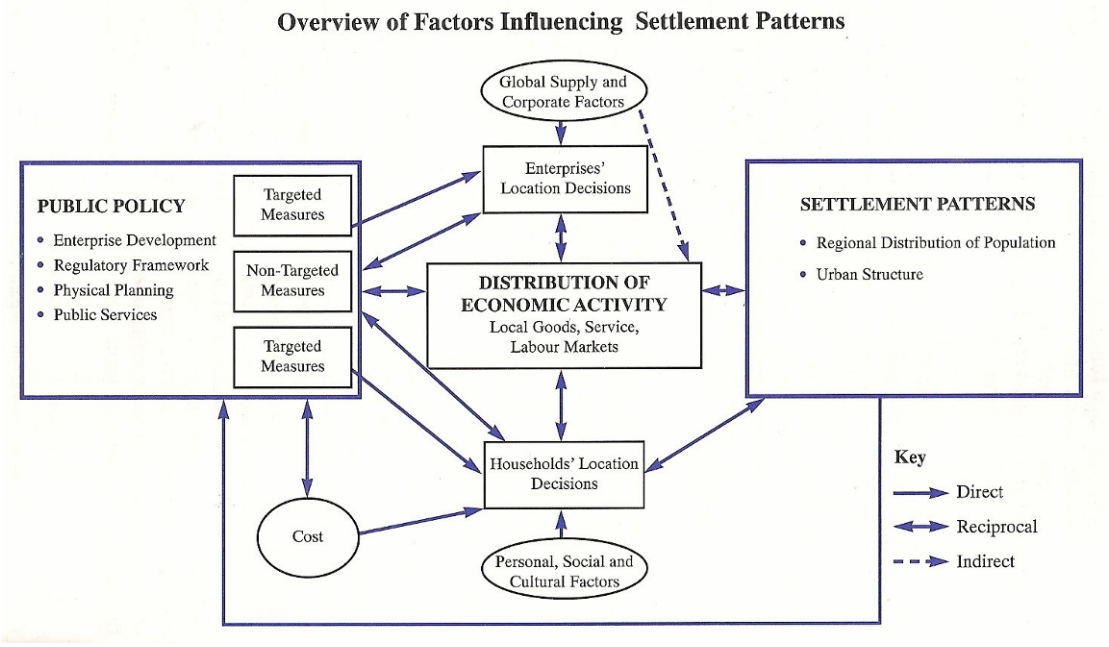
[10] The paperback edition is dated 2001.

2.3.2 Overview of Factors Influencing Settlement Patterns

The relationship between public policy and settlement patterns is set out in the following NESC102 (1997) overview (*vide* Figure 2.4). Critically, as identified by Losch (1939), the existing spatial pattern reflects the aggregate of past development, reflected in the present typology of settlement. However, as that figure shows, future settlement will very much be influenced by the pace of economic growth and the way in which economic activity will be distributed. The future distribution of Irish population and of its urban structure will be investigated against the suite of current policy instruments. Future settlement patterns and possible scenarios for economic and demographic growth will be investigated. Both of these issues are also central to the pivotal research question of this thesis.

That particular literature provides a tight framework *for understanding the relationship between factors and forces shaping settlement patterns and the distribution of population. (ibid).* The framework showing the bi-directional characteristic of most influencers, is diagrammed as follows:

Figure 2.4: Factors Influencing Settlement Patterns



Source: NESC 102 (shown as Figure 1.1)

NESC 102, vide Figure 2.4 *supra,* illustrates how settlement patterns arise from the forces of collective decisions taken by firms and households. In turn, these outcomes create 'values' which are omitted from this static Figure. Accordingly, when the history of population growth and time-dynamic considerations are added to this model, the outcome leads to an understanding of the value-led forces that determine the workings of the urban and regional economies.

Since the publication of that report some thirteen years ago and more recently resulting from the world economic downturn, banking and sovereign-debt crises, the discipline of urban economics is far more conscious of the crucial influencing factors of end-use demand and the importance of location. Zoellick (2009: 37) likewise focuses attention onto the importance of density, distance, division - barriers to interactions of people or trade and finally, to scale economics and agglomeration.

The historical theoretical basis for urban economics is considered alongside the development of economic writings of Marshall (1920) and others. The mid-period up to the 1960s and the much later birth of the [11]creative knowledge-city is succeeded by the recent period of the cerebral economy, culminating with urban economics spatial-fusion with NEG theory, as confirmed in Morgenroth (2008). The development of the knowledge economy where locations capture the benefits of economies of scale, knowledge transfer, innovation, research and development as well as the three 'Ts' of Florida (2002): Talent, Tolerance and Technology are detailed as follows. Competitive advantage results from economies of scale based on horizontal and vertical linkages, with good access and communication channels – both physical and digital. Knowledge transfer, R&D, labour and capital endowment, per-capita income, population, labour force and firm density are all significant factors in bringing this about. In the monocentric city form, Fujita (1989: 134) lists four 'commonly agreed' causes of UA as being:

[11] Murphy, et al. (2008) refer to OECD (2006) findings which show Dublin as having the highest GDP per capita growth rate between 1995 and 2002 of 78 urban areas studied. The OECD identifies a range of factors which determine urban competitiveness, higher output and productivity. They include agglomeration economics, specialisation and diversity, innovation activity, greater endowment of human capital and evidence of physical capital.

1. resource and transport advantages;
2. indivisibility and economies of scale;
3. externalities and non-price interactions, and
4. a preference for variety in consumption and production.

Having regard to Fujita's (*op cit*.) listing of the causes of urban agglomeration it is now appropriate to consider the historic literature background which provided the platform for the conceptualisation of the new economic geography (NEG) as developed by Fujita and others.

2.4 Key Issue 3 – New Economic Geography

In this sub-section the following literature subjects are pertinent:

2.4.1 The Background to Urban Agglomeration [12]

Recognition of the virtuous circle advantage of the central business district (CBD) was first made by Hurd (1903): *since value depends upon rent and rent upon location and location upon convenience and convenience upon nearness, we may say that value depends upon nearness.* In this way, the link between transportation costs and land use is established. A clearly-defined, non-residential, CBD was the focus of early ecological models of the city (after Burgess, 1925). Balchin *et al*. (1995) describe the patterning of urban land uses, as radiating outward from a single central core that inspired Burgess's Concentric Zones (1925) as following von Thunen (1826), Hoyt's Sectoral Theory (1939) or Harris and Ullman's Multi Nuclei Theory (1951) of city land uses. Up to 1951

[12] Agglomeration economics is fundamental to the economic explanation of urban growth. *Agglomeration Economies of Scale* is where costs of production fall as a result of the increased total output of a product. *Internal Economies of Scale* relate to the size of a given economic unit, be it a firm, industry or region. They are epitomised by the clustering of firms or conditions that lead to clustering. *External Economies of Scale* is typified by the size of the group of economic units and is explained by spatial proximity.

the city form had been monocentric, that is, until publication of the Harris and Ullman (1951) model with its 'Zone 7'-identification of an 'outside business district'.

Marshall (1920: 225) is regarded as the 'father' of agglomeration economics in his celebrated description of localized industries through the advantages of spillover, thus: *the mysteries of trade become no mysteries; but are as it were in the air and children learn many of them unconsciously.* In a paper: *A Theory of the Urban Land Market,* Alonso (1960) observed that: *As cities grew in importance, relatively little attention was paid to the theory of urban rents.* He noted that even the great Marshall provided interesting but only random insights: *no explicit theory of the urban land market and urban location was developed (op. cit.).*

Yet, it is evident from that description that Marshall had already identified the significance of the 'cerebral' – knowledge transfer element of work. These much debated[13] graphic-type explanations of early-to-mid twentieth-century city form and evolution, together with the diverse backgrounds of their respective authors, succeeded in laying the theoretical foundations for the emerging fields of urban spatial structure and for the discipline of urban economics.

2.4.2 The Context – the Significance of Agglomeration for Policy Formulation

Location of population and its spatial distribution has important implications for policy making according to Morgenroth (2001: 3). This is because it impacts directly on levels of public service provision as well as on economic and social development. Likewise, this literature stresses how the development of any region is related to its urban structure because agglomeration economics are important to the location of the more dynamic high technology industries.

It is almost a decade since Morgenroth (2001: 63) provided this comprehensive profile on the GDA whilst noting *that such a profile is of major importance for policy making at the national, regional and local level since, without a clear characterisation of the*

[13] For instance, Hoyt's theory was the subject of much criticism and debate but the result of such deliberations, Chapin (1965) notes *clearly indicate the profound effect the sector theory has had in stimulating awareness of the need for a theory of urban land use to which all fields can subscribe* (*ibid*. p.19). See also pp 19-21 Section: Multiple Nuclei Concept. In particular, this theory was the forerunner to the urban development pattern of the second half of the 20th century with the emergence of the US 'Edge City' as espoused by Garreau (1991).

region and local areas within it, it is difficult to identify problems which may require policy intervention. Accordingly, one of the objectives of this thesis is to advance and where relevant to the hypothesis, to update the ESRI demographic data and its context as at 2010. However, it is necessary to do this against the historic background of relevant public policy.

2.4.3 The Conflict between the Strategic Spatial Policies of Centripetal Agglomeration and Balanced Regional Development

Critical to Ireland's future policy on spatial strategy is the need to examine the developing literature that confronts the established NSS policy of balanced regional development. In such literature, it appears that the opposing 'agglomeration' policy-direction for spatial planning strategy choices presents a trans-Atlantic case for centripetal agglomeration, as advocated in Zoellick (2009). This challenges the earlier 'spread' advocacy of the European Spatial Development Perspective (ESDP) (1999) for social and economic policy purposes.

It has to be emphasised that this is not a narrow issue of USA versus EU polarity in spatial strategy, although the current ESDP approach was espoused…*indeed the European approach which embeds growth and development within an ordered and planned framework stands in stark contrast to the more unplanned, unregulated and less ordered model adopted within the United States* (Bannon, 2000). In that literature and relating to *Policy Aims and Options for the EU Territory*, Bannon lists eleven policy options, the first of which is *Polycentric and Balanced Spatial Development in the EU* (*op. cit: p.3*).

This debate at that time was being influenced, *inter alia*, by the literature of Fujita, Krugman and Venables (2001: 348). Therein is poses the critical question: *Under what conditions do economies really spontaneously evolve a core periphery pattern? Is Europe really going to be able to maintain its polycentric industrial geography?* This is of particular relevance to the pivotal research question of subject thesis; as to the population size relationship between the GDA and RoS areas of state and of its possible convergence within the 21st century. Accordingly, it is this question and its accompanying literature that, *inter alia*, the second part of this chapter now addresses.

2.5 Key Issue 4 – Public Policy - Past and Present

In this sub-section the following literature subjects are pertinent:

2.5.1 The Policy Issues

This second component of the review of literature comprises the policy issues. It commences with a brief examination of spatial policy strategy from 1966 to-date. The factors that have influenced the formulation of Irish spatial policy are analysed together with a literature review of past policy instruments and their content. Effectiveness and barriers to policy implementation are considered against the background of stated policy objectives. Differences and relationships between spatial policy and the direction of demographic growth resulting from market-force influences are examined. The tensions between short-term objectives with their 'political' agendas as contrasted with longer-term strategy-driven goals are addressed. Governance issues are reviewed so as to assess the momentum for change as against the factors reinforcing maintaining the *status quo*.

The literature for convergence versus divergence forces is reviewed and the prospects for policy change are considered. Public policy strategy provides the setting for a consideration of the pivotal role of the GDA. Future development will comprise both public and private sector investment resources and their combined effectiveness will be enhanced if public policy is amenable to both being able to operate in a complementary environment. Finally this literature review is summarised in the context of the thesis hypothesis.

2.5.2 Strategic Factors Relating to Public Policy

The long-term time horizon of the thesis research question and its ranges of potential outcomes are dependent on the thrust and direction of future public policy, considered in the

context of present circumstances. The way in which past policy has influenced the direction in which the state has emerged can be evaluated by examining some of the major strategies that have been adopted or rejected since 1966.

Accordingly it is instructive to commence with an examination of the 1968 Buchanan Plan which was eschewed and the state's Industrial Policy substituted in the early 1970s. The rejection of the ERDO Plan for the GDA in the mid-1980s is likewise reviewed. The impact of the 1986 Finance and Urban Renewal legislation is considered, together with the series of Social Partnership Agreements are reviewed, and this led into the four successive National Development Plans. In turn, the second such Plan ran parallel alongside the 2002 National Spatial Strategy.

The state Population and Labour Force Projections 2011-2041 and the latest Regional Projection to 2026 together with the current Regional Planning Guideline reviews are considered from thesis author's participation in their formulation, with the benefits of insights into their respective objectives. The review of the Irish economy in the early 21st century (NESC 117) places focus on regional dynamism which particular emphasis on the role and potential of the GDA. The Policy Literature review commences with a commentary on the importance of Agglomeration and Scale issues.

2.5.3 Core-Periphery Issues Relevant to Ireland

Fujita's (1989) question as to core/ periphery pattern is important to Ireland's future development. The issue is not the reactionary one of the traditional perception: of GDA future dominance such as would stifle and impede the growth prospects of the RoS area. Instead, the task is to investigate what can be gleaned from an understanding of the current theoretical core/ periphery model that might persuade the implementers of future Irish spatial strategy policy to consider centripetal agglomeration as opposed to balanced regional development (BRD)? Here, the theoretical work of Robert-Nicoud (2006) is instructive.

At present the Irish economy is the world's third most globalised: i.e. the measure of its exports plus imports divided by gross domestic product. Furthermore, its cost-base is very high. Robert-Nicoud (2006) advises that two noticeable features of the current international environment are capital mobility and input-output linkages. Already discussed is the fact that the FDI export-led part of the Irish economy in turn has substantially contributed to

year 2009, when for the first time knowledge exports are more valuable than its physical exports.

That author likewise, produces a counter-intuitive theoretical research result which suggests that:

> *…if the vertical linkages that bind firms with each other are large, agglomeration might even Pareto-dominate dispersion even for the population left behind at the periphery. To understand this seemingly counter-intuitive result, remember that firms trade with each other. Thus, when all firms are clustered together in a single location, intermediate inputs are cheapest because firms do not have to pay for transportation or trade costs when they purchase those inputs. This cost-saving aspect of agglomeration, which benefits all firms, is passed on to mill prices at equilibrium. When trade costs are low and vertical linkages are sufficiently strong, these lower mill prices might even translate into a lower consumer price index (which includes trade costs) for he residents at the periphery. The market also delivers a socially optimal outcome in the opposite case, that is, when vertical linkages are modest and when trade costs are near prohibitive.*

In the current Irish context, this result serves to highlight the imperative for its economy to gain competitiveness and reduce prices as a pre-condition for economic recovery. The final remark from this literature's central prediction is that in theory, agglomeration is more likely to occur when trade costs fall. In a spatial relevant context it suggests that:

> *Furthermore, the 'winners' at the core are able to compensate the 'losers' at the periphery because product variety is larger under agglomeration than under dispersion In turn, that product variety or product price reduction results in a lower price index in agglomeration.(Op .cit.)*

The core-periphery issue is also considered in Fujita et al. (2001: 322-325) which emphasises that because of the propensity to cluster, distinctions in location emerge; they *are* the forces in geographic self-organisation. This clustering is deliberate and reflects the interdependence of firms and their location decision-making. *The economy has a priori central and peripheral locations.* Accordingly the *world tends to organise itself into zones of industrial specialisation.* This, in turn, supports the case for agglomeration and its policy manifestation of centripetal agglomeration.

That particular chapter 17 in Fujita *et al*. is likewise referred to in O'Hagan (2005: 132), in categorising Ireland's regional, open, trading and increasingly cerebral economy. In forecasting that the Celtic Tiger era would end, nevertheless O'Hagan cites the Fujita literature as being both relevant to and supportive of Ireland's longer-term circumstances. The key is our exports, from an economy that presents a model of 'punctuated equilibria'.

> *Consider a region that exports some good* (sic)*. Part of the export earnings are spent and respent locally; the computer exporter pays local workers, who buy restaurant meals from chefs, who spend their money buying haircuts and so on. Now suppose that as the region grows, the proportion of export earnings that goes into local spending rises, which is plausible. Then it can be shown that as exports rise, local incomes will rise too, at first slowly, then increasingly quickly, and then it will suddenly jump from one equilibrium path to another, before resuming a slower and steadier rise. Ireland has jumped.*

This description provides a vivid insight into how changes in underlying parameters alter the pattern of trade and specialisation in a world already differentiated into industrial regions. Paraphrasing Fujita, et al. …*as transport costs fall, the world gets smaller. The punctuated equilibrium model reaches a bifurcation point at which the equilibrium structure of manufacturing regions change, giving rise to a new structure with fewer and larger manufacturing centres (ibid).*

In concluding this facet of the literature review and so as to maintain its spinal structure, the importance and relationship of population settlement size is reviewed, both in the context of end-use demand and as a contributor to location theory. In taking the interpretation of Fujita as confirmed in O'Hagan, a *'punctuated equilibrium'* Ireland can expect to have fewer and larger major centres of population, i.e. 'Lumpiness'. It is therefore instructive to consider the Alonso (1971) model for city population-size and the significance of its three central inflection points, B to D.

From Figure 2.3 *supra*, it is evident that city's population size is inefficient up to point 'B' where marginal cost is still exerting a downward pressure on average cost due to increasing economies of scale. Hence, achieving a minimum population 'threshold size' is an important objective. But that is only a first step in the growth of an economic-efficient city.

It must continue to increase so that for its existing population (P1) the average benefit-in-excess of cost gap is at its maximum at point 'C'. Further intensive expansion occurs up to point 'D' where the marginal cost matches the benefit of the last person added to the city's population at that point in time. Thus the agglomeration virtuous circle is reinforced by growth to the population level (P2). However the growth from P1 to P2 is discomforting for the existing inhabitants due to increased traffic, construction activity and environmental factors. Yet, the infusion of 'new blood' through in-migration both accelerates population growth and enhances the labour-pool. Thus in a fast growing world-population context, there is much to support the advocacy for city growth up to point D, thereby maximising the benefit for the in-migrants (*ibid*).

Alonso's model must not be viewed as being static or indeed prescriptive as to population specificity. It is reconsidered, having regard to the dynamic of time and advances in technology. The time dynamic intensifies growth pressures as end-use demand – most of the world population increase of 200,000 per day – is concentrated in city growth. This increases the imperative to have a strategic state policy for cities and their governance. The technology enhances both physical and 'soft' infrastructural capabilities, thereby 'elasticizing' the x-axis of the Alonso model in a right-hand direction.

Accordingly, it is only possible to give indicative population parameters that reflect the application of technology in terms of the infrastructural endowment for any city at any point in time. Such efficiencies are reflected in its economies of scale and thereby reflecting both past and projected capital investment and the efficient adaptation of technology.

Bergovic (1991) points to research suggesting that a city's optimum size *from the point of view of business services may well be larger than the optimum for manufacturing or construction* (Balchin *et al*, 1995: 45). He suggests that the optimum city size is 3.5 million which gives a time-dynamic indication of such advancement by way of stretching the five inflection points to the right, being 'elasticated' along the X axis of the Alonso model. Likewise, Alonso (*op. cit.*) notes in the above Figure 2.3, wherein the X-Axis point P_2 less P_1 represents the potential population quantum increase subject to public policy strategy's prior acceptance of the benefits of in-migration; i.e. the addition to that of the

existing population level of point P_1. It is noted that contemporaneous with Alonso, Richardson (1971) proffered other insightful parameters on city size determinants. [14]

The understanding of city size efficiency, discussed in Bergovic (1991) was now being associated with city classification and function. Optimum threshold size suggested that a services-dominated city has a higher population than that of an industrial city. Furthermore, optimum efficiency is not directly dependent on population size as on the efficiency of critical infrastructure (Bergovic, 1991).

Progressively since then, a new urban order is emerging, one that has been identified in the literature of Stanback, Garreau (both 1991) and Fujita (1989). Fujita (2001) has since developed the study of urban economics into one that is largely mathematical in approach, following after Richardson (1971) and others. The related literature strand of Bergovic (1991), Henderson (1999) and particularly that of Zoellick (2009) is pertinent. Thus 'urban order' is driven by economies of scale and commercial advantage: essential factors in wealth creation and motivators for physical and functional development. Accordingly it is instructive to consider these issues of specialisation and concentration in an historic review of Irish spatial policy strategy.

2.5.4 The Buchanan Report (1968)

The Buchanan Report (1968) had three stated objectives:

- The Consultant shall indicate economic growth potential, identify possible development centres, establish the level of change needed in infrastructure to facilitate growth and make proposals for policy decisions to be taken by the Government, including measures to implement such proposals.

- The Consultant shall carry out the work on the seven regions in three stages. In the first, the Consultant shall assemble existing survey information and statistics from which both the present position and present trends shall be established and on the basis of which

[14] Richardson suggested that it would be useful to measure the per capita cost of retail and office services and of urban transport facilities, social services and entertainment at different levels of population, and to estimate at what level of population agglomeration diseconomies take over from the agglomeration economies and when net social costs replace net social benefits (Balchin et al., 2006: 191-192)

any necessary forward projections shall be made. The second stage shall constitute a comprehensive analysis of the total survey information for each region as the result of which possible growth areas shall be identified. The third stage shall be concerned with the evolution of regional policies and with any implications that these may have for national policy.

- Proposals for the Dublin and Limerick regions (object of separate studies by the Government)[15] will affect economic development possibilities, population movements and transport patterns for the seven regions. The Consultant shall, therefore, take full account of these two regions in the studies to be made of the seven regions and the proposals to be submitted in respect thereof.[16]

The resultant Buchanan Plan had proposed a spatial solution by recommending a limited number of Growth Centres. It was hoped by 1986 – representing that Plan's 20-year time frame from the baseline data-sets of the 1966 Census – that the four other embryo cities would effect a substantial 'catch up' on the 1986 population of Dublin. In 1966, those four cities together had 28.40% (239,502) of Dublin's then population of 795,047. The plan's main strategy was that by 1986 these cities would have had a 20-year aggregate population of 495,000 or 44.00% of Dublin's intended population of 1,125,000. Furthermore it was proposed that four other minor growth centres, namely Dundalk, Drogheda, Sligo and Athlone would increase from a combined 1966 population of 63,996 to 190,000 by 1986.[17]

Accordingly it was proposed that the Buchanan Plan would result in the next eight largest settlements, then having only 36.45% (289,830) of Dublin's size in 1966, growing to 60.89% (685,000) of the capital's population by 1986 (per Table 24 at p. 112, Buchanan, 1968). However, the Plan's ambitious growth rate had potential for 'spill-over' benefits but this failed to convince or assuage the overwhelmingly rural population and its politicians.

[15] (1) Report and Advisory Outline Plan for the Limerick Region, 1966, by Nathaniel Lichfield and Associates.
(2) Advisory Regional Plan and Final Report for the Dublin Region, 1967, by Myles Wright.

[16] The demographic, economic and industrial aspects of the regional studies were carried out by Economic Consultants of London, Managing Director W.F. Luttrell, who also contributed to the Galway Plan.

[17] By 1986 the aggregate populations of these four towns was 87,978 and the corresponding figure for 2006 was 107,121 as per the respective censuses.

As Fitzgerald (1969) summarised:

> *The choice is between a new policy designed to ensure a rapid and badly-needed acceleration of the growth of employment* as *well as an improved distribution of jobs and population between the east and the west of the country, and existing policies which have proved inadequate under both these headings. No attempt to obscure this fact should be allowed to stand uncontroverted when so much is at stake.*

Advocating the need for concentration, the government's own Third Programme (1969: 165) proposed the implementation of an alternative, regional development policy programme in industrial growth centres, thereby increasing the number of jobs outside of Dublin, reducing emigration, rebalancing population and hastening the achievement of full employment. Despite the government's acceptance of growth centres in principle together with a further endorsement from the National Industrial Economic Council, there was overwhelming all-party political opposition to the Plan's proposal to focus most of the available resources in such concentrated format because the majority of locations would not benefit directly and substantial internal migration would be unavoidable.

2.5.5 The Eastern Region Development Organisation Plan (ERDO)

At this point it is instructive to examine the 1985 study of the GDA area 'ERDO', undertaken by the Eastern Regional Development Authority.[18] The ERDO report coincided with the commencement of an economic recession in Ireland. Shortly thereafter, the State was threatened with a public financial crisis and potential intervention of the IMF and World Bank and with a National Debt to GDP ratio having risen to 130%. Unemployment had peaked at over 18% of the State's workforce, despite net emigration having reached 40,000-plus per annum. Contemporaneously, Dublin more so than the rest of the country was suffering a severe rationalisation of its traditional, formerly trade-protected industrial base culminating in the loss of about 26% of its industrial workforce between 1971 and 1996 (Drudy et al., 1997).

[18] After publication of the ERDO Report the Government took the pre-emptive decision to abolish both this and the State's other regional bodies (McDonald, F., 2000). This was seen as a move to counteract the threat to Fianna Fail's long-standing centralist form of governance. Furthermore, any perceived intellectual challenge, especially to the largest political party of this State, invariably, ends in a similar fate, as happened on 1st September 1987 with the Haughey-administration's abolition of the national Institute for Physical Planning and Construction Research – An Forás Forbartha (MacSharry and White, 2000: 72). Those particular authors, unsurprisingly, state that this decision was based on financial considerations! Bannon and Bradley (2007: 56) place emphasis on factors, including the Government's suppression of AFF's major research report of serious planning abuse As the motivation for such actions.

For government, this concern was sounded on publication of the 1981-2011 ERDO study recommendation, wherein if implemented, its population was predicted to reach 1.85 million by 2011, representing what would be a growth of 43.39% above the GDA 1981 total of 1,290,154. Specifically, this would represent a 'straight-line' growth of 18,667 per annum which, significantly, comprised natural growth of 14,667 per annum together with a predicted 4,000 per annum figure for in-migration. It will be remembered that the GDA had achieved an average population growth of 19,200 per annum in the 20 years to 1981. That had consisted of 81.06% natural growth and 18.94% of in-migration.[19]

The background to the ERDO Report rejection by government was that it came in the wake of a further consolidation in the GDA share of State population, up from 32.16% in 1961 to 37.47% in 1981. This was despite the above-mentioned loss of much of Dublin's manufacturing employment. Over that 20-year period, the GDA had accounted for 61.45% of the State's total population growth – growth that had accelerated in the 1971-1979 intercensal period, to form the 'first step' (*vide* Fig. 1.1).

The fact that ERDO had allowed for or predicted *any* net in-migration for the GDA was counter to government policy preferences since 1973, confirmed in ERDO's clarification with DoEHLG. This confirmed that Dublin's growth thereafter was to be limited to natural increase only. It is interesting to note that the ERDO study had not been prescriptive in indicating any State population prediction for 2011 although a projection figure of 1.85 million for that census date in respect of the GDA. Perhaps those authors may have been reluctant to draw attention to further aggravate the growth differential favouring GDA over RoS. Nevertheless, given the significance of the 1961-1981 GDA share increase, there was a strong perception up to mid-1980 that such trend increase would continue. Furthermore, if the respective, achieved, GDA and RoS growth rates for that earlier twenty years were then to be replicated in the subsequent

[19] It will be recalled that the ERDO strategy was conceived in an era when manufacturing, like agriculture or extractive activity was still considered to constitute 'real' growth whereas services were considered to be viable, provided they were based on solid Primary and Secondary sector economic footing. On rejection of Buchanan 'growth centre' strategy, the government opted for a politically receptive scattergun policy of industrial activity, intended to be located in every centre of population, preferably in high-employment manufacturing: a form of scattergun dispersal akin to their 2003-announced public service decentralisation.

1981-2011 period, the 2011 State population share would have further rebalanced to 43.19% for GDA and 56.81% for the RoS area.[20]

It is noted that the census of 1971 marked the high point of 80.2% in Dublin's (city plus county) share of total GDA population. By 1981 it had diluted to 77.7%, thus providing the first conclusive evidence of population 'deflection' to the Mid-East region (*vide* Appendix 14). However, the difference in open market house values was still quite insignificant until after the Celtic Tiger had commenced in 1993, suggestive of a 'lifestyle' motivation — for moving out of the city — rather than for housing affordability reasons.

For the purpose of utilising this author's HYMOC model outlined in chapter 4 of time convergence, it is instructive to explain and show in the first table of this chapter, the respective data from which the basis points differential is extracted for that twenty years, as follows:

Table 2.1: GDA versus RoS – Respective Population Growth Rates: 1961-1981

	1961 Pop.	**1981 Pop**	**% Growth**	**% p.a. Cmpd. Growth**
GDA	906,347	1,290,154	42.35	1.78
RoS	1,911,994	2,153,251	12.62	0.59
State	2,818,341	3,443,405	22.18	Difference = 1.19% or 119 Basis Points (BP) spread

Source: Author's analysis of CSO Population data for 1961 and 1981.

The significance of these data are that given the fact that the GDA compound population growth rate – for a full twenty years – was 3.35 times that of the RoS area and, contemporaneously, that Dublin's own traditional manufacturing base had experienced severe job losses since the mid 1970s, served to show how economically vulnerable rural Ireland was and still continues to be in the absence of cities or in the absence of a policy to foster their reinvigoration and growth. It is noted that the RoS area population reached a lowest point of just 1.89 million in 1966.

[20] The basis for this statement is a continuation of the 20-year growth (1961-1981) for the GDA: 30 years of compound growth to 2011 at 1.2% per annum on its population of 1.290 million of 1981. Likewise, for the RoS area: growth at 0.4% p.a. on a 2.153 million figure as at that base-year.

It is therefore instructive to compare the ERDO projected figures (1981- 2011) with the actual population growth to 2006 census, together with author's short term projections for the five years to 2011, i.e. based on a continuation of 2002-2006 growth, thus:

Table 2.2: 1981-2011 ERDO Projected versus Actual GDA Population to 2006 and Projected (millions)

	ERDO Projected	**Actual Population**	**% Difference**
1981	1.29	1.29	-
1991	1.47	1.36	-7.48
2001	1.66	1.51	-9.04
2011	1.85	1.80 (f)	-2.70

Source: Author's analysis based on CSO 2006 census.

The ERDO study had made what now appears as being an accurate analysis of within 2.70% of this author's 2011 estimate for that date. The ERDO team had based their projection on the basis that natural growth would account for 78.57% of that growth. However, in hindsight the ERDO Appendix 4, p. 17 was overly optimistic in birth rates stating *it is considered unlikely, in spite of the sharp decrease in fertility rates over the then last [1971-1981] decade that the national fertility rate will fall below the net reproduction rate and remain there for a protracted period.*

Over a 15-year period to that point, Ireland's Total Fertility Rate (TFR) had notably declined below that figure of 2.1 children-per-birth-mother replacement rate. Today, it has recovered to a current level of 2.0 TFR.

In summary, for most of the period 1985-2011 lower deaths and higher migration will have offset the slightly reduced birth rate.[21] Perhaps the most serious criticism that can be levied against ERDO is that of the built environment, in its failure to recognise or acknowledge the 'brown field' development potential for widespread dilapidated

[21] In McDonald, F (2000: 32) and in reference to a published paper of author of subject thesis: Hughes (1999), McDonald noted: *Hughes's forecast is substantially in excess of the 2011 target figure of 1.65 million in the Strategic planning Guidelines* [SPG] *for the Greater Dublin Area, drawn up in 1999 for its seven local authorities by a consortium of consultants headed by Brady Shipman Martin. However, his figure is curiously similar to the 1.85 million projected by ERDO, the Eastern Regional Development Organisation, in its very controversial settlement strategy published in 1985, two years before it was wound up.*

condition of 1980s inner-city Dublin and of the undue focus that it had placed on peripheral, town-growth as its preferred strategy.

This thesis includes an extensive international and national literature of subject areas, including the following Primary Sources:

2.5.6 The Policy Issues Applied to Dublin and the GDA

It is recognised that whereas demography is an essential factor in shaping future growth, this is especially so for unconnected off-shore islands including Ireland where its growth prospects are determined by an underlying impetus; that of the firms, workforce and the work they create. Employment-led growth has been the hallmark of the strong economic Celtic Tiger growth era (1993-2007). In this regard, the service-sector employment-driven Dublin and its ever-widening sphere-of-influence (SoI) hinterland will anchor Ireland's growth and its long-term migration prospects – which together with the scale of the Belfast Region population,[22] will consolidate the location of the majority of its population within the eastern portion of this island (*vide* the 'Lozenge of Irish Settlements', hereunder).

The next figure identifies the clusters of settlements within the Dublin-Belfast Corridor, comprising about half of the island's six million people. It shows the thesis author's bordered lozenge of East-North East concentration of the island's settlements. As is the case of the Republic, the population density of the eastern portion of Northern Ireland is several times that of the area mainly west of the River Bann.

[22] Shaping Our Future Regional Development Strategy for Northern Ireland 2025, DRD, September 2001. (*vide* Figure 2.9 Northern Ireland Population Density 1998).

Figure 2.5: Spatial Distribution of all-Ireland Settlements of 5,000 and over – 2001/2002

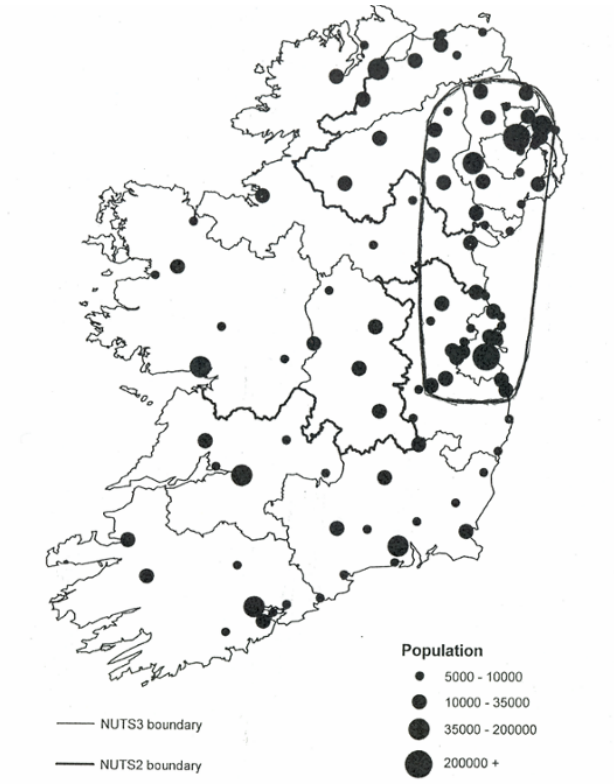


Figure 4.1 Urban centres over 5,000 population in Ireland and Northern Ireland, 2001/02

Sources: Central Statistics Office, Census SAPS file 2002; Northern Ireland Statistics and Research Agency, Census files; Ordnance Survey Ireland

The State is but a part, albeit the dominant one of this off-shore European island. With a fragile population base, together with its consequent economic dependence on export-led trade and commerce, its demography is particularly susceptible to magnifications of external and internal economic cycles as is evident from the time-dynamic demographic oscillations of Fig. 6.2. From industrial production-run experience its small population base is conspicuously unable to provide a sufficient 'home' market to take advantage of scale economics. Nevertheless, the State's potential for future long-term growth is enormous (Coleman, 2007). This is especially due to the combination of its temperate climate, its axial location – between the USA and GB and the opportunities for expansion arising from its uniquely-low population density (Hughes, 2005).

The thesis also examines specific areas of demography from the prospective future growth policy, first of the integral GDA region and of its likely ranges of proportionality: within the Republic but also with that of the entire island. This wider geographical consideration is driven by a second growth-related possibility: the physical emergence and economic potential of the Dublin-Belfast corridor. A third concurrent growth possibility is the

prospects for an 'Atlantic Technopolis' – aggregating the combined growth of Cork, Limerick and Galway in the quest to achieve balanced regional development (BRD). The fourth option is current government policy - the National Spatial Strategy (NSS) pursuing 'Gateway' and 'Node' settlement growth. Fifth is a 'do-nothing' strategy: that of *laissez-faire* market-led which *de facto* allows the GDA to 'do its own thing' in the form of a continuance of its radial-led 'sprawl' momentum into much of Leinster. This option reflects the pre-NSS period 'scattergun' approach of dispersion with three early phases of limited decentralisation. It supported a pattern of light-weight investment in towns and villages. Such past public policy outcome suggests that the State is now ill-prepared, spatially, to confront the economic problems now faced (Hughes, *ibid*).

Urban economic theory commences with the rural setting of von Thunen (1826) 'The Isolated Town' which Alonso (1960, 1965) replicated in the form of economic 'indifference curves' or as 'bid-rents', being the exchange rate in rental terms of Distance with Open Market Value. This static relationship represents a 'one point in time' condition. In reality, as urbanisation becomes more intensive in response to demography, with higher plot-ratios or densities, the time-dynamic can be represented by the combination of per-capita income with population growth, subject to effective demand – the user presumed to be willing *and* able to pay for the land-use.

As a precursor to the examination of the State's settlement pattern of towns and cities, it is instructive to undertake an analysis of its population growth over time. This is usefully done at the regional level so as to obtain a clearer understanding of the comparative dynamics of the GDA and RoS growth since 1966, the lowest point of the RoS demography.

In identifying the principal 'Driving Forces of Change' of the contemporaneous *Twice the Size* (2008) research project, it was developed out of a 6-Sector approach based on Demography, Society, Economy, Governance, Technology and Environment which in turn are related to eighteen subject areas of investigation**.**

This subject thesis likewise was informed by these areas of investigation and thesis author's participation in the demographic research for the *Twice the Size* project. This included participation in the Gateway locations visited and from the information-gathering this provided invaluable experience in material collation and analysis. This

resulted in the project's demographic input together with an analysis of the feedback from similar research including the Dublin Chamber of Commerce Envisioning Dublin Seminar (2008). Related past and current public policy issues were also considered.

The thesis hypothesis is concerned with the continuation of the state population recovery since the 1960s but in detail from 1996 when the first 'wave' of non-indigenous migration occurred. The differential growth and spatial distribution are considered for the two areas of State. With its faster growth, by 2006 the GDA population total has already converged to nearly 65% of the RoS area. This has occurred despite the high RoS area growth performance 1996-2006. Benefiting from Dublin's urban agglomeration and in the absence of cities elsewhere, the central hypothesis posits that maintaining the GDA 'traditional' future growth momentum will result in its population converging within 70 years after 2006. Accordingly, within a 110 year span beginning in 1966 it will have grown from just 34.30% of the RoS area to one of parity.

Moving to the quantitative side of Ireland's demography one of the core issues is that of future population projections. This research drew extensively from the output of the Government (CSO) Expert Group on *Population, Migration and Labour Force Projection and Forecasting.* Literature on making population projections, included the classical approaches of Speigelman (1966) and Beaujeu Garnier (1966) were observed together with the more recent methodologies, Morgenroth (2001). In turn, these tools of demographic forecasting – and in particular the combining of convergence dates and smoothing methodologies as employed by the CSO staff, were observed and considered in the development of the research methodology. So as to avoid bias and enhance the research objectivity, this study has eschewed making any population projections or assumptions.

2.5.7 Current Policy Direction

This section provides a summary outline on recent Department of the Environment (DoEHLG) policy documentation including the National Spatial Strategy (NSS), and its complementary National Development Plan (NDP) as prepared by the Department of Finance, the Regional Planning Guidelines (RPG) and where relevant, some County Development Plans. It commences with examination of the NSS (2002)

The National Spatial Strategy (NSS) (2002): This is the current spatial plan for the state up to 2020 which is described as: *a twenty-year planning framework designed to achieve a better balance of social, economic, physical development and population growth between regions.* The prime objective of the NSS is that regions and settlements may eventually perform to their own potential – without sacrificing the common good. Specifically, BRD means *developing the full potential of each area to contribute to the optimal performance of the State as a whole – economically, socially and environmentally*. (NSS 2002: 11). Further relevant sections of the NSS are considered in pertinent detail in subsequent chapters and in Appendix 3.

The National Development Plan (NDP) (2007): *Transforming Ireland: A Better Quality of Life for All.* This overall development strategy is intended to encompass the seven-year period out to 2013. Having been formulated prior to the economic downturn, this document provided for a capital development programme of €184 billion over the Plan's lifetime but since revised downwards and extended in time. The stated demographic strategy of the Plan *is to address the development requirements for a state which by 2021 may have over five million people.* Again, relevant sections are addressed in this thesis.

The Regional Planning Guidelines for the Greater Dublin Area (RPGGDA) (2004-2016): In its introduction, this Plan states that the international policy context points to the European model, *the creation of balanced development*. For Ireland, this is interpreted as recognising the importance of Dublin as the national gateway and as the engine of national economic growth. However, the RPGGDA cautions that *whereas the capital will continue to grow in population and output terms, it is not desirable for the city to continue to spread physically into the surrounding counties*. Accordingly, the physical consolidation of Dublin, supported by effective land use policies for its urban area and its transportation provision, must be aligned under existing and proposed governance arrangements. Likewise, these must be co-ordinated within the Plan's strategy objectives if the capital is to remain competitive, *vide* Appendix 4. This Plan updates the 'big picture' strategy for the GDA as was articulated in the *Strategic Planning Guidelines for the GDA* (1999).

2.5.8 Recent CSO Population Releases, Estimates and Projections

The current relevant CSO reports include the Population and Labour Force Projections (2011-2041), the Regional Population Projections (2011-2026), the 2009 Population and Migration Estimates, the Volumes 1 of the 1966, 1986 1996 and 2006 censuses. This research also draws on direct relevant experience as a member of the CSO Expert Group, which assisted in the formulation of state and regional population projections since 1994.

2.6 Key Issue 5 – Future Public Policy

In this sub-section the following literature subjects are pertinent

2.6.1 Government Population and Labour Force Projections - Current

2.6.2 Challenges Facing Policy Makers

2.6.1 Government Population and Labour Force Projections - current

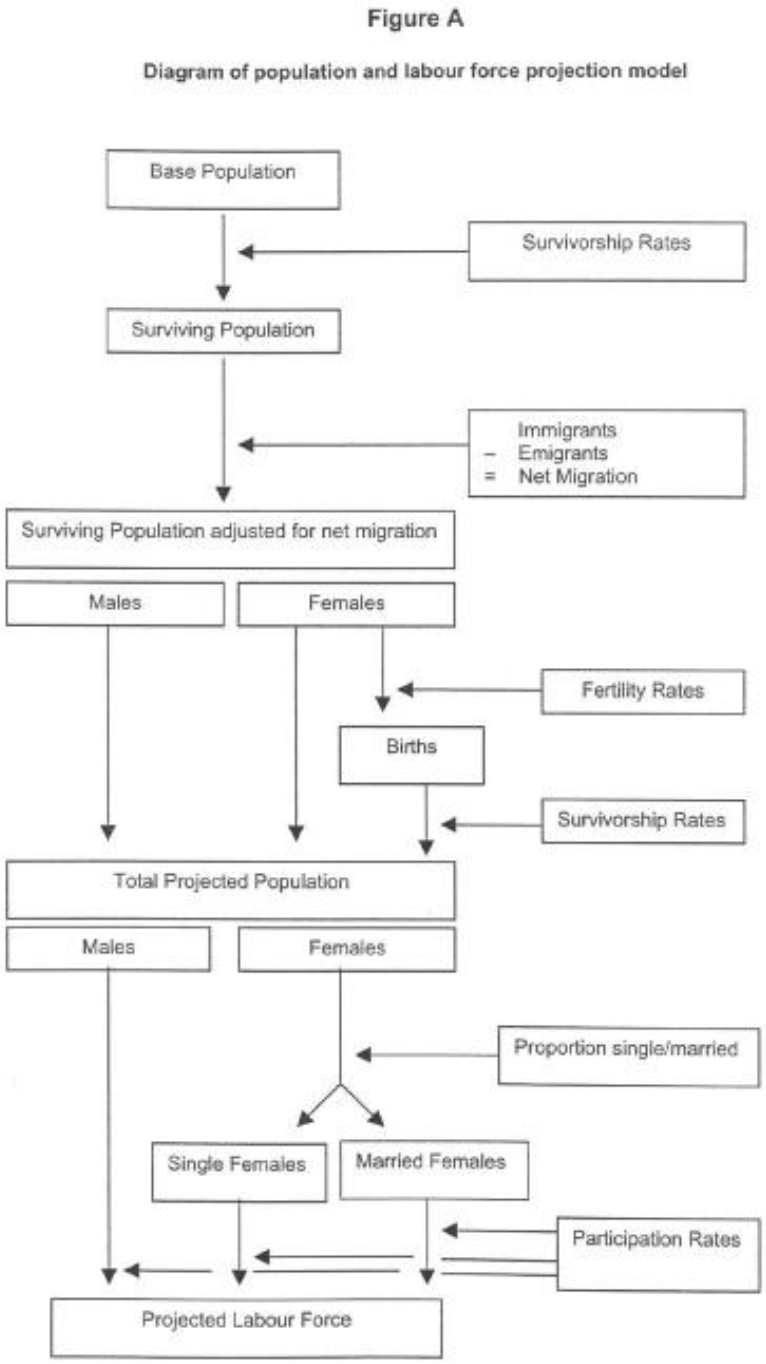
The Expert Group operating under the aegis of the Central Statistics Office produced their most recent Population and Labour Force Projections (2011-2041), in April 2008. The thesis author as a member of that Group considered the following sets of CSO assumptions for the *Population and Labour Force Projections 2011-2041* using the Projection Model as per Figure 2.6, hereunder:

- Fertility – two assumptions: A total fertility rate (TFR) of 1.88 through to 2041 **and** likewise through to 2016 but dropping to 1.7 thereafter to 2041.
- Mortality – observed improvements (1991-2005) in mortality rates by a single year of age for males and females will continue at this rate for the lifetime of the projections.
- Migration – two sets of assumptions: M1 and M2. Based on average annual net migration flows (**in thousands**) for the following seven *by 5-year* periods 2006-2011, 2011-2016, 2016-2021, 2021-2026, 2026-2031, 2031-2036 and 2036-2041, thus:

M1 assumption: related to these respective seven periods, the following average annual migration flows, in thousands, are: 60, 50, 40, 30, 30, 30, 30.

M2 assumption: (40 amended upward to 45), 30, 20, 15, 15, 15, 15.

Figure 2.6: CSO Population and Labour Force Projection Model



Source: Central Statistics Office, April 2008

From this employment-driven model it is evident for both State's regions, that labour mobility and its skills base will be critical issues for the future. This likewise is confirmed for Ireland's cities and their varying economic potentials (Thornhill, 2009).

The issue as to spatial distributions of future populations over the planning regions was the subject of the subsequent Expert Group's brief for Regional Population Projections, published in late 2008. Two sets of figures based on the M2F1 per the above April 2008 State projections were tabled at the Expert Group's meeting of 16th October 2008 in an eight-by-eight matrix of external and internal migration flows. Both sets project a State population of 5.696 million in 2026, a growth rate of 1.50% per annum compound. These are as follows:

- '**Recent' Growth Trend**: Based on *The inter-regional one-year flows between regions observed in the 2006 Census to be used for the lifetime of the projections* the GDA population is projected as 2.213 million, being 38.85% of the State's 2026 total. This implies that the RoS population at 3.483 million diverges on a compound annual growth rate of 1.61% as against only 1.43% for the GDA, a difference of 18 basis points.

- **'Traditional' Growth Trend**: This projection assumes that *'The 1996 pattern of inter-regional flows is applied in 2016 and kept constant thereafter, with difference between the 2006 and 1996 patterns apportioned.'* By 2026 the GDA will have grown to 2.374 million to 42.84% of State population at a rate of 1.80% per annum compound. The RoS area will have 3.322 million people implying a growth of just 1.29% per annum compound.

The CSO, in consultation with DoEHLG, subsequently circulated a third set of projections for both scenarios, [which] *would produce population changes consistent with the targets of the NSS*, taking account of *'provincial city agglomeration'*, '*more BRD'* and *'sustainable regional growth'*. The Expert Group spent considerable time discussing the implications of the above two outcomes.

The near-consensus view was the likelihood that none of the variants might prove to be accurate. The Group has been mindful of their discussion that nowhere in Western Europe, is there evidence of a primate/ capital city reducing its share of population. Other considerations included boundary definitions, functional urban regions and centripetal or centrifugal growth prospects in considering population projections at the regional level. It was agreed that the Group would not over emphasise the long-term effects of recent

declining-economic events because it was the view that an economic recovery was probable within three to four years.

Consideration of the radically different paths as between the Recent and the Traditional projections may be summarised in the difference of 2.83% in the share of State population by 2026, i.e. the GDA 41.68% share as against only 38.85% as per the Recent scenario. In using thesis author's HYMOC model hereunder it will be shown this represents a 'swing' of 69 basis points as between 18 BPs in favour of the RoS area as compared with the 51 BPs in the GDA's favour as adduced in the Traditional scenario. Whilst not placing undue emphasis on recent world economic and monetary events, the pragmatic reality is for a more difficult economic outlook into the medium term, to 2016 or perhaps 2021. Perusal of CSO Regional Population migration flows provide clear evidence that such flows are closely correlated with the economic cycles, being more active during times of prosperity – culminating in the unprecedented levels of in-migration 1996-2006. This would indicate a likelihood of a Traditional scenario outcome, one that accords with UA dominance.

Taking the more optimistic M1F1 Projection, based on the parameters detailed hereinabove, the following Table 2.3 data are the average annual estimates 2006-2041:

Table 2.3: Unpublished CSO Expert Group M1F1 Parameters 2006-2041

Period	Total Births	Total Deaths	Natural Increase	Change in Population	Net In-Migration
2006-2011	67	28	39	99	60
2011-2016	75	30	46	96	50
2016-2021	78	31	47	87	40
2021-2026	75	33	42	72	30
2026-2031	72	36	36	66	30
2031-3036	74	40	34	64	30
2036-2041	78	43	35	65	30

Source: CSO's Expert Group 2007 workings.

Based on just two slight variations of M1F1, for mortality options *which apply after 2021,* the following State population projections are adduced, 2011-2041, thus:

Table 2.4: State Projected Populations to 2041: Mortality Options A and B

April	2011	2016	2021	2026	2031	2036	2041
Option A	4,733,300	5,210,919	5,643,557	6,001,692	6,332,113	6,652,287	6,974,813
Option B	4,733,300	5,210,919	5,643,557	5,996,029	6,311,930	6,609,190	6,900,918

Source: CSO's Expert Group 2007 workings.

The identified 'second step' (Fig. 1.1) growth period commenced in the mid-1990s. It included not just the intercensal 1996-2002 period but since then and post-9/11 resulted in an even more intensive level of population growth – as confirmed in the 2006 census and subsequent Population and Migration Estimates..

The following analysis confirms the extent of intensification by way of identifying four distinct, consecutive tranches of upward growth which have taken place since 1991. The demographic evidence confirms this 'second step' of growth as accelerating, being more robust and of longer duration than that of the 'first-step' of the 1970s.

Table 2.5: Recent Tranches of Population Growth in the Republic of Ireland

Annual Growth Period	Average (000's) Natural Growth	In-Migration	Annual Growth	Compound % in population
5 years 1991-1996	18	2	20	0.57%
4 years to April 2000	21	20	41	1.12%
4 years to April 2004	31	33	64	1.65%
4 years to April 2008	38	59	97	2.30%

Source: CSO Census Data 1991-2006 and Population and Migration Estimates for Years 2007 and 2008, Analysis: Thesis author.

In the 17-year period to April 2009, the State's population grew by nearly one million. Since April 2004 and for the following five years the average annual growth of 97,000 was by far the most robust in the State's history, with each year's growth being almost equivalent to the five year aggregate growth that occurred 1991-1996. The natural growth contribution was 48.8% with in-migration comprising 51.2%.

From a position in 1991 when migration was almost static and natural growth was under half of its current level, the most recent year's estimates, the CSO *Population and Migration Estimates* to April 2009 suggests that natural growth is re-emerging as the strongest constituent of population growth. This will undoubtedly be the case from 2009

onwards. How might this demographic prospect impinge on future decision making? Some of the issues relating to related policy-making for the GDA together with Louth were examined against the background of an evolving planning framework.

2.6.2 Challenges Facing Future Policy Makers

Scott, et al. (2003) concluded in relation to the Dublin – Belfast Corridor, and the challenges facing policy-makers for implementation of a polycentric urban development policy, that the issue of land delivery is a crucial one. They identify three particular facets of such policy implementation as the timing and cost of land delivery, planning procedures and finally, the political process and consumer and lifestyle choice. One specific challenge is the now-suspended government decentralisation programme which included strong resistance from personnel from within the civil service. To date, less than 29% of the intended transfers have taken place.

There is a strong evidence-base to support the claim that this policy was anti-city in nature. Many NSS Gateway or Hub-designated locations were ignored in the 2003 Government Decentralisation programme. The second city, Cork was even scheduled to have had two of its *own* functions transferred to provincial towns in Cork County. The Decentralisation strategy appears to contradict the policy direction of the NSS and in doing so dilutes the opportunity to contribute to critical mass in the embryo cities. The following data for the programme, intended that almost three-quarters of the relocated job would transfer to non NSS-designated locations and critically only 4.20% of all jobs were earmarked for the embryo cities, with Galway receiving none.

Table 2.6: Decentralisation Destinations: Classification of Receiving Locations

Destinations	Jobs	% of Jobs
'Gateway' locations (4 out of 8, excluding Dublin)	1,390	13.50 %
'Hub' locations (6 out of 9 town-clusters)	1,257	12.20%
43 non NSS-Gateway/ Hub Designated towns	7,653	74.30 %
Total Decentralisation	10,300	100.00%

Source: Minister McCreevy's Budget Speech, December 2003, Location Schedule, collated by thesis author.[23] Note: A further 600-plus jobs from the HSE and computer services were subsequently included.

[23] A formal appraisal has yet to be undertaken of the cost of this Decentralisation. However the Irish Times editorial of 6th May 2009, entitled: 'An Unholy Mess' states … *At a rough estimate, it has cost a minimum €360,000 for each of the 2,500 civil and public servants who have been relocated out of Dublin during the past six years.*

The now 'deferred' programme calls into question whether such policy could reduce regional imbalances. For Irish spatial strategy, the 43 dispersed towns that comprised so many locations outside the SoI of embryo cities are unlikely to compensate for the urgent requirement to concentrate growth in a way that can initiate urban agglomeration.[24] One interviewee suggested that a counter-proposal, to channel the majority of the jobs to Cork, Limerick and Galway would have overcome most management and administration problems whilst achieving the objective of creating considerable gravity-mass for those cities.

2.7 Conclusions to the Literature Review - Addressing the Pivotal Question

In arriving at the conclusion outcomes for this Literature Review and with the introduction of population projections and their computational methodologies in Figure 2.6 together with the CSO parameters, reference has already been made to the two quite different sets of historic growth identified by the CSO, namely 'Recent' and 'Traditional'. Clearly, the inconsistencies in the outcomes from these past growth rates and their differing comparative results for the GDA and RoS areas needs to be factored into future scenario-making. This is a particularly sensitive issue that will be addressed later in this research. It must also be done in a way that is objective and without political interference.

2.8 Conclusions and Linkages to Areas of Methodology

Through Eurostat the EU has classified Ireland by the Nomenclature of Territorial Units for Statistics (NUTS) as a region 1, in recognition of its scale size, alongside five other member or associated countries: the Czech Republic, Slovakia, Sweden, Norway and Switzerland. The state is viewed by the EU as an *economic region* within the island itself and likewise, within the north-west Europe theatre of the EU. As a small, open economy, it is categorised by its low-density, mono-centric primate capital core with a comparatively under-populated peripheral region having small and medium sized settlements.

[24] The Budget of 2008 reversed much of the Decentralisation Programme by way of postponing 38 of the 53 locations. It also 'suspended' the capital programme which that editorial notes has resulted in… *the sale of €500 million of State property and an additional charge of €400 million for the acquisition of new sites and offices at scores of locations.* A further issue has been the loss of corporate knowledge.

In conclusion, this literature review has clarified both the theoretical framework and the policy issues as the respective sectors that are relevant to the pivotal research question of the thesis hypothesis. Whereas there was little evidence of disagreement in the population projection rates formulated by the CSO Expert Group when last in session to consider the Regional Projections, it subsequently emerged some nine months following that particular sitting that the DoEHLG was independently, adopting a quite different assumption as to the growth path *differential* implying a negative differential for the GDA compared with the RoS area. The significance and implications of this occurrence will be addressed in Chapter 6. The next chapter commences by introducing the methodology framework and the techniques to be deployed for both the quantitative and qualitative analysis to be used in the pivotal research question of this thesis.

CHAPTER 3: METHODOLOGY

3.1 Introduction to the Hughes Years Matrix of Convergence (HYMOC) Model

In introducing the model in the first chapter, it was noted that it is based on the exponential projection principle, of differing growth rates which, if maintained on such growth paths, the respective graph curves will normally diverge or converge. For this to happen within a lifetime their relative starting positions are assumed not to be remote. Even though the GDA has yet to achieve a 40% share of state population, should its long-term growth rate continue to exceed that of the RoS area, on this basis at some future date, the expectation would be that its steeper population growth projection curve would converge with the RoS curve. At the 2006 census the GDA share of state population stood at 39.21% and axiomatically, the RoS area population contained 60.79%. Accordingly the main quantitative element of this thesis focuses on parameters such as these being utilised in a time-measured model utilising various scenarios.

Such a model should be capable of accommodating negative as well as positive growth, because of Ireland's two-way history of migration. This has been the demographic component with the greatest influence on its population performance (*vide* Figure 6.2). Past records of such performance may be expected at best, to give limited, short-term indications of future population behaviour. However it has to be noted, that with one inter-censal exception in the late 19th century, the GDA population has otherwise always grown.

Perusal of such historic data also confirms that without exception, in each succeeding census since the first ever census of 1841 the GDA population has continued to converge on that of the RoS area. In one particular respect however, the application ofthis model is artificially contrived. Both because of differing birth and death rates in addition to the migration oscillations, there is never a 'steady state' of population performance, again which is evident from Figure 6.2, *vide infra*.

3.2 The Quantitative Measurement Tools Used to Support the Hypothesis

In this section the following considerations are discussed:

3.2.1 Model's Characteristics and Properties:

3.2.2 Hughes Years Matrix of Convergence HYMOC – Author's Model of Population Convergence

3.2.1 Model's Characteristics and Properties

The required model is intended to act as a policy support tool in evaluating implications of varying population growth levels. Furthermore both its grounding equations may be used for more-detailed time-estimation purposes, in EXCEL format, (*vide* 3.7 and 3.8, *infra*). Accordingly, its presentation of years – the time span for convergence to occur, is displayed in a matrix fashion for ease of use. If a scenario is formulated, e.g., the 1966-2006 'recent' trend were to continue, such model should be able to indicate time-wise, when the GDA population would converge with the RoS area. It should replicate the exponential pattern of population growth. It should also be able to accommodate negative population growth, given the past history of out-migration sometimes exceeding natural growth. Its presentation in tabular, matrix form is designed to facilitate ready reckoning.

3.2.2 Hughes Years Matrix of Convergence (HYMOC) – Model of Population Convergence

In terms of the 'core' quantitative contribution of subject thesis, it is appropriate to examine a method for measuring and comparing the respective population growth curves for the GDA and RoS areas. The following empirical methodology is based on a population convergence time-scale that takes the form of an equation, i.e. of the GDA population over a certain time period equalling that of the RoS area. Accordingly, such convergence of GDA and RoS populations is reflected in the time-scale format of 'years', whereby the GDA population growth may 'converge' by way of a faster exponential growth-track, in an upward graph curve that intersects at a future date with that of the RoS area as in Figure 4.1.

Initially, the conception of the research model was derived from an iterative methodology, the spreadsheet of 'result in years' is set out in Table 3.1 hereunder. Its use is intended as a strategy indicator 'tool' of indicative time-frames, based on a variety of

parameters. As might be expected, the initial iterative individual calculations for the fifty-five sets of data shown in this matrix required considerable research time and effort. Furthermore, the accuracy of such work required a facility for cross-checking and verifying its mathematical integrity. Thus, it proved necessary to synthesise the methodology in order to present its underlying formula, devised in the form of a generic equation of a mathematically standardised exponential expression.

The methodological framework for this thesis was also designed to cope with its major areas of investigation. For its qualitative research, this was facilitated by author's research activity. The original June 2009 hand-up date would have preceded the deeper economic downturn timing that since might have warranted a somewhat more downbeat economic assessment. Likewise, that time preceded the publication of CSO demographic and their QNHS data referable to year to April 2009. Nevertheless, it is not the issue of population growth that is at issue but rather the differential in the specific growth rate differential as between the future populations of the two areas.

In devising the HYMOC convergence model, its conceptualisation and development are followed by an examination of the model's algebraic and logs-based formulation under both compounding and continuous conditions, together with their respective formulae and EXCEL notations. The basis-point application of its graphical presentation is based on a year-by-year growth schedule, Table 4.1, in assessing the GDA and RoS population projections over a near seventy-year period. It provides a visual confirmation of the model's robustness – its flexibility is adaptable to either growth or contraction of population as historically represents the case for this offshore island, once a growth differentiation is chosen.

The value of this research tool and its potential in contributing to spatial strategy is discussed, in the context of the economic reversal of the Irish economy to June 2009. This is especially so in the light of the thesis demographic analysis which compares and contrasts the growth expectations of the NSS with what is actually taking place based on CSO data.

3.3 A Convergence Table - GDA equalling RoS Population

As described in the preceding section, the principle upon which both sides of an equation is formulated, takes the form of the 'start-date' population *growth-rate difference* between the two areas of the State. That difference is assumed to prevail and is used in the model for the entire period, from 'now' up to and beyond convergence. The measurement is in a 'basis points' (BP) difference in the compound annual growth rates for each region or area under examination for specific time periods, e.g. as in Table 4.2, although over a much longer time period.

The horizontal 'header' line sets out various GDA percentages share of State population as for example its 39.21% share of state population at the 2006 census. The vertical left-hand column show differing BP growth assumptions. For example, a 33 BP difference in favour of the GDA is the figure that represents the CSO's (2008) M2F1 expectation, projected out to 2026. In addition to the aforementioned 33BP, this 'prototype' matrix comprises a range of 'basis points', from 25 to 100 thereby providing a comprehensive 'years' matrix picture of the time dynamic effect on convergence.[25]

The resultant matrix of years to convergence figures represent the 'poles' of extremity: 100 for example, in a current demographic context, would assume that the GDA Natural Growth advantage, of say 25 basis-points, is augmented by a favourable in-migration performance advantage of 75, as compared with an improbable zero in aggregate for RoS. At the other end of the scale, the 25 'basis points' of the first row of 'years' data, would be just above the 1996-2006 population growth differential, that GDA currently enjoys over RoS under the 'recent' growth scenario reported by CSO.

The horizontal axis of this set of data in bold, shows the hypothetic range of percentages. The 39.2% is the 2002 census GDA share of State population whereas the 40.7% represents the forecasted CSO (2005) share in 2021. The resultant matrix of 'Years to Convergence' data, as described in the preceding section, shows the array of years including any fractional year. Those figures in bold would conform to a positive thesis

[25] Historically, analysis of the GDA's consistently higher population growth, when compared with that of the RoS area, has resulted in a 68 basis points difference (1841-1996) which if maintained, will result in 21st century convergence, as is shown for this and for other time periods, in Tables 5.12 (a) to (e) series herein.

hypothesis: otherwise the 'null' hypothesis would prevail, i.e., convergence would take more than 50 years, thus:

Table 3.1: Original 'Hughes Indicator of Years of Convergence' [HYMOC]: when GDA equals Rest of State Population:

GDA Basis Points in excess of RoS (The GDA assumed start position as % of State Population: 2006 census = 39.21%)

HYMOC TABLE	**39.21%**	**40.0%**	**40.7%**	**42%**	**43%**	**44%**	**45%**	**46%**	**47%**	**48%**	**49%**
25 Basis Points	178	165	153	133	115	98	82	65	**49**	**33**	**16**
33 Basis Points	135	125	116	100	87	75	62	**50**	**37**	**25**	**13**
50 Basis Points	90	82	77	66	58	**49**	**41**	**33**	**25**	**17**	**8**
75 Basis points	60	55	51	**44**	**39**	**33**	**28**	**22**	**17**	**11**	**6**
100 Basis points	**45**	**42**	**39**	**33**	**29**	**25**	**21**	**17**	**13**	**9**	**1**

Source: Author's iterative individual computations based on the stated formula, which is as follows:

Initially, each individual calculation was derived, by inductive means and resolved iteratively. This was based on the exponential and in solving the following equation by iterative means as described, thus:

> *GDA % Share times (GDA per annum Compound Growth) to the power of (projected) Years is equal to RoS % Share times (RoS per annum Compound Growth) to the power of (the same projected) Years.*

This researcher's formulation and iterative calculations, in respect of above Table's 'years' data, is based on deploying the exponent – that represents the time-scale in whole years – to the nearest thereof, which is then applied to the respective growth rate percent per annum compound. Then, both sides are multiplied by the start positions, i.e., respective GDA and RoS estimated population percentages as at the start of the projection period. Subsequently, the accuracy of the entire content of the matrix was independently confirmed from first principles with the results of the formulation, as next described.

The second element of this quantitative approach comprised deriving, also from first principles, a standardised generic mathematical formula, resulting from consultation with DIT academic colleagues. The formula is shown firstly in common logs and then in natural logs. Thesis author's original concept – akin to Parry's Valuation Tables (1961) – is to present the resultant matrix in a compounded annually format, as achieved in the common logs format. As with Parry, this 'in arrears' approach understates the time-period to convergence. First, we show this calculation:

3.3.1 The Compounded Annually *Formula*

Mathematically, this is expressed as n = log (PROS / PGDA) all over log (1+iGDA / 1+iRoS) where 'n' is the number of years to convergence – in this case, where the GDA population will equal that of RoS. In this formula, it is confirmed that the log is 'standard base ten' as distinct from 'natural' log. P denotes the start population of the GDA and RoS, respectively, as designated in the formula. Small 'i' stands for the rate of compound annual population growth.

As confirmed, this formula understates the period to convergence because, conceptually, it is annual in arrears-based. The finessing solution accommodating the elapse of time is achieved by treating it as continuous from 'day one'.

3.3.2 The Continuous Compounding *Formula*

This variation, based on the 'natural' log – the function whose rate of growth is 'itself' - overcomes the problem of arrears compounding and instead, accommodates growth *ab initio*. Mathematically, n = natural log times the quotient of the larger populated area and the smaller one. In turn, this is divided by the difference in their populations, expressed thus: Natural log ln or 'e' (PRoS / PGDA) all over iGDA minus iRoS.

The derivation of the above mathematical statements is as follows:-

Firstly, *Annual* Compounding is set out, noting that in order to test the thesis hypothesis, an assumption was made that GDA's population growth rate 'i' would be double that of RoS, i.e., 2 x i versus 1 x i, akin to the example of the 2001 Regional Population Projections that had showed a calculated differential of 102 Basis Points. Then,

expressed by way of an equation using logarithms, in 'n' years time following the 2002 census of population, their respective populations would converge: thus:

$$P_{GDA}(1+2i)^n = P_{Ros}(1+i)^n$$
$$\Rightarrow \left(\frac{1+2i}{1+i}\right)^n = \left\{\frac{P_{Ros}}{P_{GDA}}\right\}$$
$$\Rightarrow n\log\left(\frac{1+2i}{1+i}\right) = \log\left\{\frac{P_{Ros}}{P_{GDA}}\right\}$$
$$\Rightarrow n = \frac{\log\left\{\frac{P_{Ros}}{P_{GDA}}\right\}}{\log\left(\frac{1+2i}{1+i}\right)}$$

For continuous Compounding

$$n = \frac{\log_e\left\{\frac{P_{Ros}}{P_{GDA}}\right\}}{2i-i} = \frac{\log_e\left\{\frac{P_{Ros}}{P_{GDA}}\right\}}{i};$$

where i=annual % growth in Ros

NB : For 25% basis points 2i-i becomes 1.25i-i=0.25i

$$\Rightarrow n = \frac{\log_e\left\{\frac{P_{Ros}}{P_{GDA}}\right\}}{1.25i-i} = \frac{\log_e\left\{\frac{P_{Ros}}{P_{GDA}}\right\}}{0.25i}$$

Given that the population of the GDA based on 2002= P_{GDA} and that the population of the rest of the state (RoS now) = P_{ROS} and $k_{GDA} = 2i\%$ while $k_{GDA} = i\%$ then the two populations will be equal at some time n years from now. Using the compounding formula:

$$P_{GDA}(1+2i)^n = P_{Ros}(1+i)^n$$
$$\Rightarrow \left(\frac{1+2i}{1+i}\right)^n = \left\{\frac{P_{Ros}}{P_{GDA}}\right\}$$
$$\Rightarrow n\log\left(\frac{1+2i}{1+i}\right) = \log\left\{\frac{P_{Ros}}{P_{GDA}}\right\}$$
$$\Rightarrow n = \frac{\log\left\{\frac{P_{Ros}}{P_{GDA}}\right\}}{\log\left(\frac{1+2i}{1+i}\right)}$$

Confirming the 2002 census, the GDA=1,535,446 and the RoS = 2,381,757.

$$\frac{P_{Ros}}{P_{GDA}} = \frac{2,381,757}{1,535,446} = 1.5511825$$

At this ratio the population of the GDA is 39.1975% of the RoS.

The value of n when the population of the GDA will be equal to the RoS is given by :

$$n = \frac{\log\left\{\frac{2,381,757}{1,535,446}\right\}}{\log\left(\frac{1.02}{1.01}\right)} = 44.6\,years$$

The third task in the methodology was to present the standardised formula into a spreadsheet format. This enabled the 50 'years' thesis-hypothesis outcomes of the matrix to be compared with this author's earlier individual empirical calculations, as set out in Table 3.1, *supra*. These data, obtained from respective EXCEL formulae, to two places of decimals, show the results in years. This was independently verified by a colleague who kindly provided and tested each data set as set out in the following Table 3.2 Matrix. This verification confirms the general thrust of the earlier workings and, in doing so, validates author's original prototype model concept.

3.4 The Module's Formulae Presented in EXCEL Format

The fourth task is to consider the respective formula presented hereunder in EXCEL format, commencing with the application of Common Logs.

3.4.1 The Common LOG EXCEL Formula for HYMOC Model

fX = LOG((1+I2)/I2)/LOG(((1+$J$1+$A$7/100*$J$1))/(1+$J$1))

The following Table 3.2 comprises the Common Log Matrix of the Years values derived from above formula. Selecting a data cell to show the outcome, for say 100 BP in favour of the GDA, where that region's commencing population is 45.0% share of State. For clarification, 100 basis points (BP) superiority results in 20.37 years to convergence expressed to two places of decimals, occupying the (last – 100BP) **fifth** row of data with the 45 percentage population growth gap being located on the **seventh**

column of data in the matrix as shown bold with the outcome in years to convergence, thus:

Table 3.2: HYMOC Common LOG Model

HYMOC Common Logs (LOG):	GDA as % of the State Population shown below in bold horizontally:-										
Basis Points shown bold vertically	**0.392**	**0.400**	**0.407**	**0.420**	**0.430**	**0.440**	**0.450**	**0.460**	**0.470**	**0.480**	**0.490**
25	177.54	164.01	152.25	130.56	114.01	97.55	81.17	64.86	48.60	32.38	16.18
33	134.55	124.30	115.38	98.95	86.40	73.93	61.52	49.15	36.83	24.54	12.26
50	**88.88**	82.11	76.22	65.36	57.07	48.84	40.64	32.47	24.33	16.21	8.10
75	59.33	54.81	50.87	43.63	38.10	32.60	27.12	21.67	16.24	10.82	5.41
100	44.55	41.15	38.20	32.76	28.61	24.48	**20.37**	16.27	12.19	8.12	4.06

Source: Application of the Common Log Formula to thesis author's Convergence equation layout.

For demonstration purposes assuming a BP difference of 100 and a GDA share of 45% of State population, the **fX** (equation) result is for population convergence to take place in 20.37 years time as shown in bold on the matrix. It is noted that the 2006 census outcome with GDA population share of 39.21%, if it is presumed to have a long-term historic population growth superiority of say 50 BP, then that convergence would take 88.88 years as shown in bold, i.e. in 2095 from April 2006 census. This would result in a null thesis hypothesis (i.e. >50 years).

For a positive hypothesis time-convergence outcome of exactly 50 years at 39.20% population share would imply an unlikely sustained gap of just over 90 BPs of superior GDA growth, Already it is apparent that GDA convergence is likely to be a longer-term process than was envisaged when the thesis write-up commenced.

As noted, the Common Log formulation overstates the time period to convergence by between 1% and 1.2%. So as to accord with the time continuity from 'now', the Natural Log formulation is deployed because of its uniqueness already noted – it being the function whose rate of growth is 'itself'. It is derived from the following LN algebra as set out in EXCEL, thus:

3.4.2 The Natural LOG EXCEL Formula for the HYMOC Model

A. NATURAL LN FORMULA: fX = LN((1+I12)/I12)/$F$10*$A$17/100

Applying the same parameters and cell location as in the previous example, from perusal of the following Table 3.3 it is noted that the 100 BP cell is positioned on the **fifth** row of the spreadsheet. Here, based on a 45% starting population share, the **fX** convergence is 20.07 years as shown in Table 5.10. Assuming 50 BP and at 39.20% GDA population share as in the 2006 census, the timescale is 87.78 years, producing a time-reduction of 1.0125% when compared with the common log formulation. Thus in order to accord with the thesis hypothesis for a fifty-year time scale, on the 2006 GDA population share, the 'core' region would still have to achieve a near-90 BP superior population growth outcome for the entire period out to 2056.

Table 3.3: HYMOC Natural Log Model

HYMOC Natural Logs (LN):	GDA as % of the State Population shown below in bold horizontally:-						Seventh column				
Basis Points shown bold vertically	**0.392**	**0.400**	**0.407**	**0.420**	**0.430**	**0.440**	**0.450**	**0.460**	**0.470**	**0.480**	**0.490**
25	175.57	162.19	150.55	129.11	112.74	96.46	80.27	64.14	48.06	32.02	16.00
33	133.00	122.87	114.05	97.81	85.41	73.08	60.81	48.59	36.41	24.26	12.12
50	**87.78**	81.09	75.28	64.55	56.37	48.23	40.13	32.07	24.03	16.01	8.00
75	58.52	54.06	50.18	43.04	37.58	32.15	26.76	21.38	16.02	10.67	5.33
100	43.89	40.55	37.64	32.28	28.19	24.12	**20.07**	16.03	12.01	8.00	4.00

Source: Author's application the Natural Log Formula to HYMOC equation.

Perusal of this spreadsheet confirms that for similar time-frames, once the growth rate differential is consistent at whatever rate of population growth (or contraction) is projected, convergence occurs at the *same* time, albeit with minor variations. Thus the robustness of the HYMOC model is affirmed. This graph provides visual confirmation of the veracity of the model's formulae for simultaneous sets of convergence, using the same BP difference. A similar outcome occurs when the Natural Log formulation is deployed, with a timescale convergence of just over one year earlier, i.e., toward the end of 2074.

Final verification of the equation concept was achieved, when both sets of HYMOC Common and Continuous Log matrices were extended to include a 50% 'share of population' column. As expected, this 'test' results in a 'zero' years outcome for all BP values contained in the respective interactive spreadsheets. This outcome of zero readings at the 50% share thereby provides conclusive verification of both the underlying algebra and logs application, being the resultant EXCEL formulae application as described hereinabove.

For the demographic practitioner, the two Hughes Years Matrix of Convergence (HYMOC) Indicators are intended to provide a similar facility for easy reckoning. The process of applying growth projections - especially for demographics, should properly be viewed as being continuous, whereby the compounding effect commences 'now' and not at the end of a period such as a year, which otherwise would mirror the 'inaccuracy' that arises from Parry's time-in-arrears basis of computation. Thus, the generic formula's use of natural logs achieves complete accuracy because '*e*' itself represents the aggregate of all future growth flows to infinity, in that its own base 2.71828 is this irrational number '*e'* or exponent which represents *the derivative of a log to an arbitrary base, thus: log x to the base 10 = log x to the base e times log e to the base 10.* Likewise, 'e' is the aggregate of 1+1/1!+1/2!+1/3!+…+1/n! are always 2.17828, with ! as the factorial.

In conclusion, this chapter has outlined the methodology and relevant mathematical areas used to formulate a model for ascertaining future convergence. The demographic application of this model to the pivotal question of the thesis hypothesis is addressed in the next chapter.

CHAPTER 4: HYMOC APPLICATION - RESULTS AND RELATED QUANTITATIVE CONSIDERATIONS

This chapter comprises both a quantitative analysis of the HYMOC population survey data together with other related quantitative methodologies that are relevant to the thesis hypothesis and consists of the following subsections:

4.1 HYMOC Results

This quantitative analysis commences with an historic analysis of the GDA and RoS population growth, as a basis for assessing both the 'traditional' and 'recent' trend. From this, a number of scenarios are considered and formulated from sensitivity to assumptions, pronounced deviations from underlying trends from the data used, extraneous developments on labour market conditions which influenced either the trend or deviation from trend in the data.

In this section of the thesis the following issues are addressed.

4.1.1 Observations and Application using the 'HYMOC Indicator

This author's hypothesis was formulated when Ireland was in the middle of an unprecedented era of economic and demographic growth although the events of 9/11 had already occurred. The research hypothesis requires the GDA population to converge on the RoS area population within the later part of this century. For this to happen, there would need to be a restoration to a pre-1996 population path of convergence. It will be shown that it is one that extends back beyond the 1966 baseline to the first census of 1841.

In section 4.2 herein, author's Basis Points (BP) analysis for 1966 to 1996 will confirm a 65 BP spread in favour of the GDA, which the CSO- described as the 'traditional' state population growth pattern (*vide* Table 4.2). However, over the final 10 years since the 1996 census as per their described 'recent' trend, the process of convergence has slowed to just 19 BP (*vide* Table 4.3). In developing the thesis spinal argument, further demographic analysis will show that this significant change was primarily due to the RoS area obtaining an unprecedented share of the State's total in-migration during 1996-2006 – in sharp contrast with the pre-1996 'traditional' out-migration from that area. In turn, it will be shown from emerging evidence that this 10-year movement has sharply reversed and that the swing back to the 'Traditional' demographic growth path is now underway.

4.1.2 Application of the CSO's Central Regional Scenario to 2026

The CSO (2008) publication of its Expert Group's (EG) latest Regional Population Projections includes its principal M2F1 'Traditional' projection out to 2026. This central scenario predicts that the GDA will grow at 65 BP faster than the RoS area because of the Expert Group discussion and recognition of Dublin's unique urban agglomeration benefit. On continuation of that assumption into the second half of this century, the following graph and its accompanying spreadsheet, in applying the common logs basis - confirms that the GDA population will match that of the RoS area in a 68.45-year timeframe after the 2006 census, i.e., late in 2074.

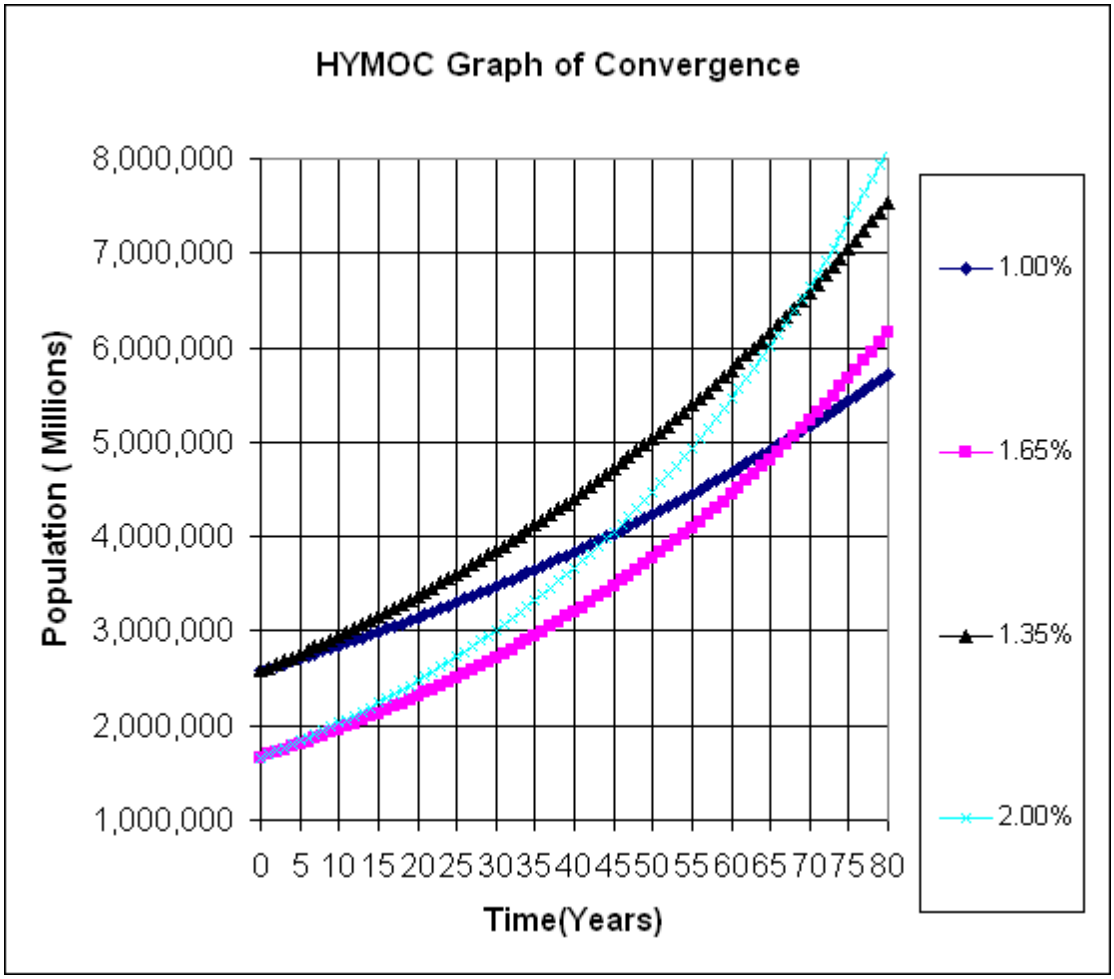
Two sets of projections, both of which apply the 65 BP spread in GDA's favour are shown. The purpose is to confirm graphically for the two areas of State, that it is not absolute growth but, rather, the *differential* growth rate that is the important factor that ensures convergence. Demographically, this is of significance, given Ireland's historic two-way population migration movement.

In view of the state's historic propensity to out-migrate more often than to receive population, such differentiation especially as between a 'core' and 'peripheral' regional could result in combinations of positive or negative BP growth differences. Thus, it is the *superior* BP spread between the GDA and RoS area that commands attention. This was an important mathematical consideration in the conceptualisation of the HYMOC model in its ability to be able to accommodate two-way movements.

4.2 Findings from HYMOC Spreadsheet Data – The Convergence Graph

The graphical application of the following Figure 4.1 shows two pairs of graph lines. The pink and blue graph lines trace the exponentials of the GDA and RoS populations respectively, increasing at comparatively slow demographic rates of 1% and 1.65% per annum compound. Likewise, in applying the *same* growth rate differential of 65 BP, the turquoise and black graph lines portray the faster growth rates of 1.35% and 2.00% for the GDA and RoS area, respectively.

Figure 4.1: HYMOC Convergence Graph



Source: Application of HYMOC to two growth scenarios with 65 BP differences

Here the Pink is compared with Blue (Low Growth scenario) and Turquoise with Black (High Growth scenario). This graph is grounded on the common logs exponential growth data which is set out in the following Table 4.1. Convergence is noted to occur in year 69 on the line which is shown bold in the second page of the following table 4.1.

As the start point is the April 2006 Census which is shown as line zero, the population convergence as per the Table data is seen to occur in 2075. In that year the respective projected populations for the GDA exceed those of the RoS areas for the first time in *both* scenarios. After converging in 2081, the respective GDA populations diverge above those of the RoS area.

Table 4.1: Grounding Population Data for HYMOC Graph

(Annual in Arrears – Common Logs Basis – Growth Rate: % p.a. compound)

Year (0 = 2006)	**Low Growth Comparisons**		**High Growth Comparisons**	
Graph colours:	**Pink RoS**	**Blue GDA**	**Turquoise RoS**	**Black GDA**
Growth rate p.a.	**1.00%**	**1.65%**	**1.35%**	**2.00%**
N (years)	1.00%	1.65%	1.35%	2.00%
0	2,577,312	1,662,536	2,577,312	1,662,536
1	2,603,085	1,689,968	2,612,106	1,695,787
2	2,629,116	1,717,852	2,647,369	1,729,702
3	2,655,407	1,746,197	2,683,109	1,764,297
4	2,681,961	1,775,009	2,719,331	1,799,582
5	2,708,781	1,804,297	2,756,042	1,835,574
6	2,735,869	1,834,068	2,793,248	1,872,286
7	2,763,227	1,864,330	2,830,957	1,909,731
8	2,790,860	1,895,091	2,869,175	1,947,926
9	2,818,768	1,926,360	2,907,909	1,986,884
10	2,846,956	1,958,145	2,947,166	2,026,622
11	2,875,425	1,990,455	2,986,952	2,067,155
12	2,904,180	2,023,297	3,027,276	2,108,498
13	2,933,221	2,056,681	3,068,144	2,150,668
14	2,962,554	2,090,617	3,109,564	2,193,681
15	2,992,179	2,125,112	3,151,543	2,237,555
16	3,022,101	2,160,176	3,194,089	2,282,306
17	3,052,322	2,195,819	3,237,209	2,327,952
18	3,082,845	2,232,050	3,280,912	2,374,511
19	3,113,674	2,268,879	3,325,204	2,422,001
20	3,144,810	2,306,315	3,370,094	2,470,441
21	3,176,259	2,344,370	3,415,591	2,519,850
22	3,208,021	2,383,052	3,461,701	2,570,247
23	3,240,101	2,422,372	3,508,434	2,621,652
24	3,272,502	2,462,341	3,555,798	2,674,085
25	3,305,227	2,502,970	3,603,801	2,727,567
26	3,338,280	2,544,269	3,652,452	2,782,118
27	3,371,662	2,586,249	3,701,761	2,837,760
28	3,405,379	2,628,922	3,751,734	2,894,515
29	3,439,433	2,672,300	3,802,383	2,952,406
30	3473,827	2,716,393	3,853,715	3,011,454
31	3,508,565	2,761,213	3,905,740	3,071,683

32	3,543,651	2,806,773	3,958,468	3,133,117
33	3,579,088	2,853,085	4,011,907	3,195,779
34	3,614,878	2,900,161	4,066,068	3,259,694
35	3,651,027	2,948,013	4,120,960	3,324,888
36	3,687,538	2,996,656	4,176,593	3,391,386
37	3,724,413	3,046,101	4,232,977	3,459,214
38	3,761,657	3,096,361	4,290,122	3,528,398
39	3,799,274	3,147,451	4,348,038	3,598,966
40	3,837,266	3,199,384	4,406,737	3,670,945
41	3,875,639	3,252,174	4,466,228	3,744,364
42	3,914,395	3,305,835	4,526,522	3,819,252
43	3,953,539	3,360,381	4,587,630	3,895,637
44	3,993,075	3,415,827	4,649,563	3,973549
45	4,033,006	3,472,188	4,712,332	4,053,020
46	4,073,336	3,529,480	4,775,949	4,134,081
47	4,114,069	3,587,716	4,840,424	4,216,762
48	4,155,210	3,646,913	4,905,770	4,301,098
49	4,196,762	3,707,087	4,971,997	4,387,120
50	4,238,729	3,768,254	5,039,119	4,474,862
51	4,281,117	3,830,431	5,107,147	4,564,359
52	4,323,928	3,893,633	5,176,094	4,655,646
53	4,367,167	3,957,878	5,245,971	4,748,759
54	4,410,839	4,023,183	5,316,792	4,843,735
55	4,454,947	4,089,565	5,388,569	4,940,609
56	4,499,497	4,157,043	5,461,314	5,039,421
57	4,544,492	4,225,634	5,535,042	5,140,210
58	4,589,936	4,295,357	5,609,765	5,243,014
59	4,635,836	4,366,230	5,685,497	5,347,874
60	4,682,194	4,438,273	5,762,251	5,454,832
61	4,729,016	4,511,505	5,840,041	5,563,928
62	4,776,306	4,585,945	5,918,882	5,675,207
63	4,824,069	4,661,613	5,998,787	5,788,711
64	4,872,310	4,738,529	6,079,771	5,904,485
65	4,921,033	4,816,715	6,161,847	6,022,575
66	4,970,243	4,896,191	6,245,032	6,143,027
67	5,019,946	4,976,978	6,329,340	6,265,887
68	5,070,145	5,059,098	6,414,786	6,391,205
69	**5,120,847**	**5,142,573**	**6,501,386**	**6,519,029**
70	5,172,055	5,227,426	6,589,155	6,649,410
71	5,223,776	5,313,678	6,678108	6,782,398
72	5,276,014	5,401,354	6,768,263	6,918,046
73	5,328,774	5,490,476	6,859,634	7,056,407

Source: Application of HYMOC common log formula to the Census of 2006 GDA and RoS populations.

4.3 Historic Basis Points Analysis

In this section the research assembles the historic population data and in a standardised tabular analysis, displaying the population growth, percentage growth and percentage per annum compound growth, in line with Morgenroth (2001).

In this section of the thesis the following issues are addressed.

4.3.1 Discussion of Math and Data Implications
4.3.2 Observations of Spreadsheet Data - Limitations
4.3.3 Analysis of Results from the HYMOC Model

It is now instructive to examine the following analysis based on the above Table 4.1, so as to assemble comparable long-term historic population growth data, which can then be applied to the HYMOC model. Reverting back to the thesis baseline timeframe of 1966 the BP spread for the next thirty years to 1996 is shown in the next table.

Table 4.2: GDA and RoS Population Performance (1966-1996)

	1966 Population	1996 Population	30-year Growth In Population	% Growth	% per annum Compound Growth
GDA	989,202	1,405,671	416,469	42.10	1.18
RoS	1,894,800	2,220,416	325,616	17.18	0.53
Outcome: GDA/RoS Basis Points spread: =					**65**

Source: Author's analysis of CSO Population Data for 1966 and 1996 censuses.

In comparing the two sets of data from the HYMOC Matrix it is noted that the time periods for *continuous compounding* Matrix Table 3.3 are 1% to 1.2% shorter than for Matrix Table 3.2 for *in arrears compounding*, because Table 3.3 reflects the effect of continuous compounding. It has been noted that HYMOC Matrix Table is the accurate depiction of the convergence time-period. The HYMOC Convergence Graph as shown in Figure 4.1 is formulated on the annual-in-arrears basis.

In applying the continuous '*e*' natural-log formulation, the BP spread is thus close to – albeit slightly below – the time indicated for convergence to occur, i.e., 68 years. On the basis of continuation into the future of the long-term population growth rates, the implicit

BP spread and process of convergence between the two areas of State indicates that convergence would take place by 2074, based on the 2006 census data. The BP-Spread concept is useful for long-term demographic evaluation in that it avoids specific growth-rate selection but instead focuses on the growth-rate *differentials*.

This is significant because is not possible to accurately project population beyond a twenty year period as that would presume foreknowledge of the TFR of birth-mothers, some of whom are not yet born. On the other hand, the concept of growth differentiation has the advantage of being able to replicate historic, long-term records of regional growth differences, i.e. the 65 BP as analysed for the 1966-1996 CSO-described 'traditional' growth period as per Table 4.2 *supra*.

In evaluating the differences between short and long-term population growth it is necessary to have regard to growth volumes over time and when the major population movements occurred. Accordingly, the 'weighting' effect of the two must be taken into account. Over the intercensal short-term 10-years, the Celtic Tiger 'recent' growth was more evenly dispersed throughout the State because of unprecedented economic prosperity, albeit the GDA growth was still superior to that of RoS in 1996-2006 by 19 BPs as confirmed in Table 4.3, thus:

Table 4.3: GDA and RoS Population Performance: 1996-2006

	1996 Population	2006 Population	1996-2006 Growth In Population	% Growth	Growth per annum Compound
GDA	1,405,671	1,662,536	256,865	18.27	1.69%
RoS	2,220,416	2,577,312	356,896	16.07	1.50%
			Basis Points spread: =		**19**

Source: Author's analysis of CSO Population Data for 1996 and 2006 Censuses

In the ten years to 2006 as shown above, although the GDA population growth was an impressive 1.69% per annum compound, the RoS area still grew at 1.50% per annum compound. The GDA superior natural growth performance effectively, was nearly counter-balanced by the RoS majority share of State net in-migration due to their respective population weightings.

The HYMOC indicator shows that with a 19 Basis Points and a 39.213% population share, it would take the GDA 210 years to converge with RoS's population, indicating a definitive null hypothesis thesis outcome. Accordingly, in combining the two tables, the forty year BP spread 1966-2006 results in a spread reduction to 54 as confirmed thus:

Table 4.4: GDA and RoS Population Performance (1966-2006)

	1966 Population	2006 Population	40-year Growth In Population	% Growth	% per annum Compound
GDA	989,202	1,662,536	673,334	68.07	1.31
RoS	1,894,800	2577,312	682,512	36.02	0.77
GDA/RoS Basis Points spread: =					**54**

Source: Author's analysis of CSO Population Data for 1966 and 1996 censuses.

If the weighted 54 BP spread (1966-2006) were to continue into the long-term, then the GDA convergence with the RoS population would occur in 83.35 years time, i.e. in 2089, per the common logs basis. This outcome is fourteen years longer than the 65 BP spread as replicates the 1966-1996 'traditional' period.

The HYMOC Spreadsheet years' data confirms that if the GDA population growth were to reach a 43% to 44% share of state population, in terms of the thesis hypothesis time-frame this would approach a 'critically' tipping point which would trigger the process of the GDA acceleration in its population convergence with the RoS area. A range of iterations confirm that provided the BP differential is maintained below 43.5 years, then – albeit with slight differentiation – the convergence 'years' outcome will be substantially uniform.[26] This has implication for a politically-driven policy strategy.

4.3.1 Discussion of Math and Data Implications

[26] The extent of variation is such that if a 100 basis points differential is maintained thus for 2i-i, then for three places of decimals convergence is shown as 44.560 years as per the table matrix. For 3i-2i – albeit representing a somewhat unrealistic (for First World) growth rate, the outcome becomes 44.999 years to convergence and for an even more unrealistic assumption of 4i-3i of Nigerian-type growth, the result becomes 45.438 years. This outcome serves to increase confidence in HYMOC's usefulness and applicability whilst these test verifications confirm the robustness of the generic formula itself, in its applicability to conventional demographic quantitative analysis.

As the process of UA accelerates, it would be expected that the GDA favourable long-term differential growth rate would further strengthen. The observation from this analysis is instructive, particularly from strategic public policy and spatial planning viewpoints. If the GDA is to be 'prevented' from attaining a majority population position within this century, the strategic opportunity to do so effectively only exists for as long as its share of State population can be held below this critical 43.50% 'tipping point' share. Thereafter, convergence becomes increasingly inevitable. This is so because in a more cerebral/ knowledge-based society the technologies that generate the UA effect, progressively favour larger economies of scale.[27]

In terms of possible outcomes for future population performance, three particular questions arise:

(a) In an era of anticipated lower economic growth post-2007, how will the RoS economy and consequent employment growth perform, in the near-absence of urban agglomerative opportunities?

(b) In the context of 'core' and 'peripheral' regional demographic dynamics, will there be a tendency for a portion of the population – including the in-migrants in particular – to filter back to the core GDA city-region in a longer time-frame?

(c) A third question for public policy consideration is the core versus periphery outcome in a prolonged period of economic downturn. Would there be a discernible difference in the GDA and RoS rates of external out-migration.

The urban economic intuition is that the recent completion and commissioning of much needed infrastructural improvement which is both economic and capable of being funded, is able to keep a city (Dublin) ahead of its congestion, and other related diseconomies, for example, in showing Alonso's 1971 Regional Science Figure 2.3 model. (p. 32, *supra*): at least to its inflection point 'D' on the 'X' axis of city population. Against that is the fact that the current year marks the completion of the inter-city motorways which, in turn raises a related research issue: will this infrastructure be of greater benefit to Dublin or to the other cities? However, Balchin *et al*. (2000: 74-76) raise the possibility that further city-growth can, and does, occur up to inflection

[27] See for example Robert-Nicoud (2006) 'Agglomeration and Trade with Input –Output Linkages and Capital Mobility', Regional Studies Association, *Spatial Economic Analysis*, Vol 1, No. 1, pp. 101-126: June 2006, ISSN: 1742-1772, Routledge.

point E where average costs and benefits converge. Apart from these issues of population levels, Morgenroth (2008) cautions as to spatial over-specialisation of labour where an economic shock can lead to sudden severe job losses, exemplified by the loss of a region's or county's major employment source.

Thus, the central issue regarding the thesis hypothesis, of 21st century GDA population convergence, focuses on whether pre-1996 'traditional' growth differentials might resume or, whether the 'recent' much more closely-matched post-1996 population growth performance for the two areas of State will maintain, into the longer-term future, as the norm?

Against a prospective background of tougher economic and job-creation prospect, particularly for provincial Ireland with its fragile settlement base and in the assumed absence of UA in the RoS area, to what extent would this accelerate the GDA population convergence so as to occur sooner? Utilising the HYMOC indicator, and assuming a 40 Basis Point spread in favour of GDA, the HYMOC matrix indicates that GDA would have 42.53% share of State population by 2041.[28] This, as stated hereinabove, is approaching the critical point of rapid acceleration to convergence.

Thus, if 1996-2006 out-turn proves to be the exception and should, therefore, the 'normal' long-term BP difference of 65 re-emerge, then the thesis hypothesis of 50/ 50 convergence by late-century in population share would be more plausible. In pursuing this corollary, this research next investigated the spatial dynamics of specific county population movements, for anywhere currently deemed to be within Dublin's SoI and in doing so, removes the hypothesis stricture, i.e. is not confined just to the GDA.

Perusal at the county level of 'Cartograms of population change in Ireland (1841-2002)' by Martin Charlton in Bartley and Kitchin (2007: 16), when modified over time, these show that by 2002 the State's 50/ 50 population split-line is located in a tightened geographical cordon around the 'third band' of mainly outer Leinster counties surrounding the GDA boundary (*vide* Appendix 11). Spatially, this analysis confirms the accelerating population growth for the seven GDA-adjacent and adjoining counties. Together with the GDA, they comprise 52.77% of the 2006 State population and 26.41%

[28] The 40 BP difference represents the outcome of the CSO projections to 2041.

of its surface area. Clearly Dublin's influence is less marked over the more remote portions of these counties**.** Despite the said cartogram being mostly related to historic periods well before the thesis baseline of 1966, as shown in Appendix 11 for illustrative purposes only, it serves to confirm the long-term spatial trend in a contraction of the state's population 50% centre of gravity towards Dublin.

Two points are noted: first that each of these counties adjoins the outer GDA boundary and second, that in aggregate this group of counties enjoyed a superior population growth differential of 63.54% when compared with the other RoS counties in the ten years up to the 2006 census. Another band of outward radius from Dublin would be similar in concept to Barrington and Horner (1994) and likewise, to the Alonso Figure 4.2, *infra.*

Thus, when regard is had to this aggregate seven-county 'third band' 1996-2006 growth rate of 23.19% (Dublin and Mid East taken as the first and second bands) as compared with only 14.18% for the aggregate fifteen remaining counties of the RoS area, in the absence of other plausible explanations, it is assumed that Dublin's overspill population movement and its geographical proximity to these counties exerts the capital's UA sphere-of-influence effect; one that has directly generated this superior growth differential of 63.54%. This is confirmed by unpublished CSO one-year flow internal migration data.

In deploying the methodology of a direct pro-rata measure of that differential when applied to the seven-county 2006 population aggregate of 574,641, this confirms that the same 63.54% or 351,376 people of those counties are deemed to be within the capital's sphere-of-influence. This equates to 8.29% of total State population of 4,239,848 as at the April 2006 census. When added to the GDA 39.21% population share, it has meant that by April 2006 some 47.50% of State population is deemed by this research to be within Dublin's sphere-of-influence. This pro-rata methodology, albeit somewhat crude, is herein suggested as a practical alternative to conducting a 'purist' electoral district-level FUR-type demographic analysis over the seven-county area. The UCD research centre *Urban Institute Ireland* is undertaking ongoing research, on the Dublin FUR area, along these lines.

From consideration of the location of the towns within these counties, it is confirmed that for the most part, they are located close to the GDA boundary – the 'straddling' largest

town of Drogheda being the most conspicuous example. The conclusion from this interpretation is that this 63.54% population of these seven counties may be occupying a surface area of approximately the same size as the GDA and contiguous to it – say 7,000 square kilometres. In turn, this conclusion would also indicate that the 47.50% of State population that is deemed to be within Dublin's sphere-of-influence occupies the 20% of State surface area that is concentrated on Dublin. Based on this crude sphere-of-influence assessment, the next step is to compare the respective population growth rates 1996-2006, as between the two parts of the State; within and outside Dublin's influence. This is set out as follows:

Table 4.5: Population Performances (1996-2006) and Resultant BP Differential

	1996 Population	2006 Population	% Growth	% Growth
GDA + 7 adjacent counties	1,872,144	2,237,177	19.50	1.80
Remaining 15 counties	1,753,943	2,002,671	14.18	1.33
BP Growth Differential			**=**	**47**

Source: Author's analysis of 1996 and 2006 CSO censuses.

The penultimate step in this methodological sequence is to apply the resultant basis points differential to author's HYMOC indicator so as to assess the actual time-frame for future population convergence to take place. In so doing, the assumption is made that this population growth differential 1996-2006, is to be maintained for the entire period to convergence.

In the final stage of author's quantitative methodology, both for increased accuracy and for the purpose of demonstrating its flexibility, the Continuous Compounding rather than the Annual Compounding variant of the HYMOC indicator is deployed. The first task is to examine horizontally, the area between 47% and 48%, interpolating for the already-determined value of 47.50%, *supra*. Likewise, vertically within the matrix, the area of interest also to be interpolated, lies within the 33 and 50 line spheres, having regard to the pre-established 40 basis points.

Having completed and combined both sets of interpolation for this wider geographic area, the outcome of 25.88 years emerges. Accordingly on such basis, these finding would lie comfortably within the 50 year timescale of thesis base-hypothesis.

Furthermore, this 'positive' outcome, applicable at the April 2006 census base-date, shows that a consolidated area may comprise somewhat less than 20% of the State's surface area centred on Dublin, depending on issues such as intensification of future development, consolidated or dispersed morphologies. Here, the analysis of town growth relative to distance, undertaken by this research is instructive (*vide infra* Sectoral Town Population and Distance Analysis, in Case Study One, Appendix 7) Public policy strategic considerations as well as those of economic and governance will be central to the eventual outcome of population concentration focused on Dublin.

In brief, the interpretation of thesis-proven (extended area) hypothesis demonstration is as follows: Within twenty-six or so years following the 2006 census, on the basis of the population trend and its dynamic established since 1996, an extended area surrounding Dublin will comprise 50% of State population. Today, this comprises considerably less than the combined surface area of the GDA *plus* its adjacent seven counties. Depending on future development trends favouring centripetal growth, fuel price, density parameters and lifestyle constraints, this points to an ever-decreasing surface area of these seven counties *together with* the GDA will accommodate that 50% demographic-geographic determinant (*vide* Appendix 11, of the cartogram 50/50 population-spatial trend for years 1841, 1926 and 2002).

In summary, Dublin's monocentric functional urban region remains morphologically steadfast. Polycentric trends, where evident to-date, appear to be more prominent in the capital's super-suburbs (7-12 kilometre radius) rather than in its sphere-of-influence towns (at 20-80 kilometre distances): these latter growth-settlements are serving primarily as dormitory towns, with weak empirical evidence so far of advanced producer services-type (APS) employment (Hall and Pain, 2006: 206): Focusing just on this APS criterion as per that literature, Dublin contained 88.60% of that study-area's employment as at 2005.

4.3.2 Findings of the Spreadsheet Data

In investigating whether the pivotal research question outcome can be achieved, a range of comparative exercises are facilitated by the HYMOC application, depending on the

'targets' that are set. Its major drawback, in its current simplified format, is that it requires predetermined assumptions to be made involving long time frames with the questionable deployment of single-growth exponentials for each area or settlement under examination. Furthermore, the underlying hypothesis assumption is for convergence: yet, parallel or divergent paths are also possibilities! Notwithstanding such recognised limitations, this research presents the HYMOC model as per thesis hypothesis, if for no other use or application than as a modus to draw strategists' and policy makers' attention to the historic reality. Specifically, it has been done so as to demonstrate a GDA convergence outcome, as per the matrix of convergence years and to their respective variations, dependent on the size of the BP spread.

Finally, this exercise raises a pertinent Urban Economic question on growth assumptions on the part of those who conceived and drafted the NSS. Could BRD be achieved in the absence of urban agglomeration conditionality?

4.3.3 Analysis of Results from the HYMOC Model

The next task is to demonstrate the application of the HYMOC Model. This comprises undertaking empirical investigation of a selection of possible population growth scenarios as between the GDA and RoS areas. A number of key variations are addressed based on the following influencers for population growth rates thus

- World and Northern European growth rates as per the UN projections
- Economic conditions: growth, recession or steady state
- State population projections to 2041, using the CSO Expert Group criteria.
- Regional variations to 2026, per the Group's findings [Sect. 3.4 *supra*].
- Urban and Rural variations based on pre-1996 trends.
- Similarly, for post-1996 with the onset of non-indigenous in-migration.
- Assumption as to centrifugal – outward 'deflection' dominance.
- Alternatively, centripetal agglomeration or densification.
- Emergence of alternative centres within the island, specifically Belfast and Cork.
- Benefits arising from the Peace Agreement and its spatial effects.

In each case the results of the application of the model will produce a time outcome – that is, if convergence is to occur. The results of these empirical investigations are then assessed and discussed in the following sections of this chapter.

Commencing with the model's application to the 30-year 1966-1996 'traditional' population outturn, a summary of the components of growth to the respective areas is detailed so as to show the internal migration movements within the GDA, thus

Table 4.6: GDA and RoS Population Performance (1966-1996) – 'Traditional'

Population Component	State	Dublin	Mid-East	GDA	RoS
N.G	889,853	321,321	105,084	426,405	468,448
Net Mig	-147,768	-58,104	48,321	-9,783	-137,985
Population growth	**742,085**	**263,217**	**153,405**	**416,622**	**325,463**

Source: Author's analysis of CSO unpublished 'flow' data from 1966 to 1996.

During 1966-1996 there is evidence of out-migration from Dublin, particularly as its central area between the canals loses population in a 'doughnut' effect which has since has been reversed. Its out-migration represents an 83.16% equivalent of total in-migration into the Mid-East. However, this is a simplistic 'view' because no distinction is made as between internal and external migration movements between the planning regions.

Over this 30-year period the GDA accounted for just 6.63% of state emigration, the 93.37% of which out-migrated from the RoS area. In relation to the natural growth component, the GDA share was, and remains well ahead of population share which reflects a lower age profile population. This is confirmed with the RoS area's higher pro-rata death rate.

Next, the 10-year 'recent' 1996-2006 population performance data are set out, thus:

Table 4.7: GDA and RoS Population Performance (1996-2006) – 'Recent'

	State	Dublin	Mid-East	GDA	RoS
N.G	268,549	92,584	44,521	137,105	131,444
Net Mig	345,212	36,328	83,432	119,760	225,452
Population growth	**613,761**	**128,912**	**127,953**	**256,865**	**356,896**

Source: Author's analysis of CSO Vital Statistics data from 1996 to 2006.

Perusal of this table confirms that the RoS area experienced disproportionate in-migration compared with the GDA during this Celtic Tiger decade. Even within the GDA itself, the Mid-East in-migration was more than twice that of Dublin's. Considerable in-migration, mainly from Eastern Europe, was engaged in RoS area house-building activity which, since 2008 has practically ceased, resulting in a reversal in the trend of that particular movement (CSO, 2010). Government policy for asylum-seekers directed in-migrants to rural towns and villages, mainly into the RoS area also assisted the population growth.

In summary, the unprecedented RoS area population 'recent' growth during 1996-2006, comprised a net in-migration content of 63.17%. This significant historic contribution to its population growth will be discussed in Chapter 6, in the context of the RoS area's long-term prospects for being able to maintain a close differential of basis points (BP) alignment with that of the GDA.

4.4 Application of the HYMOC Model

It has already been shown in the graph of Figure 1.1, *supra*), that population growth or contraction does not perform evenly over time, as evident in Ireland's two 'steps' of growth over 1966-2006. It is therefore even more unrealistic to assume for a period of over twice this length in time to that of the 2070s or 2080s, wherein an even rate of growth could be contemplated, as per Table 4.1. This does not invalidate the application of realistic growth rates, *per se*, over any time period. What is sought after is the identification of trends based on theory and their subsequent applicability and practicability. Nonetheless, the formulation of theory and its application will have relevance for policy strategy application purposes, particularly where different agencies and departments of state are believed to hold widely divergent interpretations of likely future growth. This will be considered at length in Chapters 6 and 7.

4.5 Associated Quantitative Methodologies Relating to HYMOC - Introduction

A number of subsidiary relevant issues are addressed hereunder so as to augment the quantitative research aspect of this chapter. They are intended to show, *inter alia*, the characteristics of the state's demography including its urban to rural composition, Dublin's concentric growth patterns and growth projections, settlement growth relative to distance

and a time-comparison of Dublin with Cork. Due to space limitations, two additional but related Case Studies are detailed in Appendices 7 and 8.

Appendix 7 comprises a Case Study on Settlement Distance from Dublin and Population Growth. The following Appendix 8 is a case study on the state's two largest settlements, Dublin and Cork and their Regions Compared.

This subsection consists of:

4.5.1 History of Urban-Rural Population Growth and Share 1966-2006
4.5.2 The CSO Population and Labour Force Projections
4.5.3 Alonso's Bid Rent Function

4.5.1 History of Urban-Rural Population Growth and Share Composition 1966-2006

It is evident, in the absence of the contiguous Dublin settlement with a 2006 population of 1,045,769 plus its surrounding plateau of sizable GDA towns which totalled 404,278 together with an additional rural content, that the RoS area's population is still significantly 'rural' in composition, as confirmed in the following table.

Table 4.8: Republic of Ireland Urban and Rural Population Composition: 2006 Census:

	GDA	%	Rest of State	%	State	%
Urban	1,450,047	87.22	1,124,266	43.62	2,574,313	60.72
Rural	212,489	12.78	1,453,046	56.38	1,665,535	39.28
Total	**1,662,536**	**100.00**	**2,577,312**	**100.00**	**4,239, 848**	**100.00**

Source: Author's analysis of CSO 2006 Census of Population, Vol. 1, Table 4.

Excluding Dublin city with 40.04% of the State's aggregate urban population the residual urban population for the state comprise 1,528,544 as compared with the State's total 'rural' population of 1,665,535. The settlement of Dublin has 62.90% of the entire GDA population in 2006 which is somewhat less than its corresponding share 20 years earlier, due to the aggregate growth of its commuter towns. It is instructive to compare 2006 data with the baseline comparatives for 1966 as set out in the next table, thus:

Table 4.9: Republic of Ireland Urban and Rural Population Composition: 1966 Census:

	GDA	%	Rest of State	%	State	%
Urban	814,976	82.39	604,088	31.88	1,419,064	49.20
Rural	174,226	17.61	1,290,712	68.12	1,464,938	50.80
Total	**989,202**	**100.00**	**1,894,800**	**100.00**	**2,884,002**	**100.00**

Source: Author's analysis of CSO 1966 Census of Population, Vol. 1.

In 2006 the state's population share in urban settlements of 1,500 and over is 60.72% compared with 49.20% in 1966. Over that 40-year period the state population grew by 1,355,846 or 47.01%. Its urban population grew by 81.41% whereas the rural contracted by 13.69%. Examining the corresponding data for 1996 facilitates the analysis of urban and rural growth for the two areas of state over the 'recent' 1996-2006 period.

Table 4.10: Republic of Ireland Urban and Rural Population Composition: 1996 Census:

	GDA	%	Rest of State	%	State	%
Urban	1,222,399	86.96	927,676	41.78	2,150,075	59.29
Rural	183,272	13.04	1,292,740	58.22	1,476,012	40.71
Total	**1,405,671**	**100.00**	**2,220,416**	**100.00**	**3,626,087**	**100.00**

Source: Author's analysis of CSO 1966 Census of Population, Vol. 1.

4.5.2 The CSO Population and Labour Force Projections

In recent years the CSO's activities have evolved from a careful monitoring of queries from researchers and other sources. They have proved invaluable assistance for subject thesis by collating state demographic data facilitating the treating of the GDA as a separate identity. This is evident in recent releases of state and regional labour force projections.

By doing this it gives recognition to the importance of the two-area entities in which the state is now evolving. Their approach will also assist areas such as strategic real estate decision-making, given the National Asset Management Agency (NAMA) requirement that assessment of long-term economic-value will adduce CSO demographic projections, not least in the area of residential zoned land for housing demand assessment, *vide infra* Chapter 4.6.6. Likewise, their work will have relevance in the fields of urban economics in its interface with the New Economic Geography (NEG) where data availability is crucial (Morgenroth, 2008).

One such origin of the linkage between the two disciplines, which has particular relevance to the pivotal research question of this research, is now considered. It is the Alonso (1960 and 1964) *Bid Rent Function* which affirms the strong inter-relationship dynamic between land-use and transportation. This in turn, will assist the assessment of a prospective centripetal morphology reversal to the historic and current centrifugal outward pattern of growth.

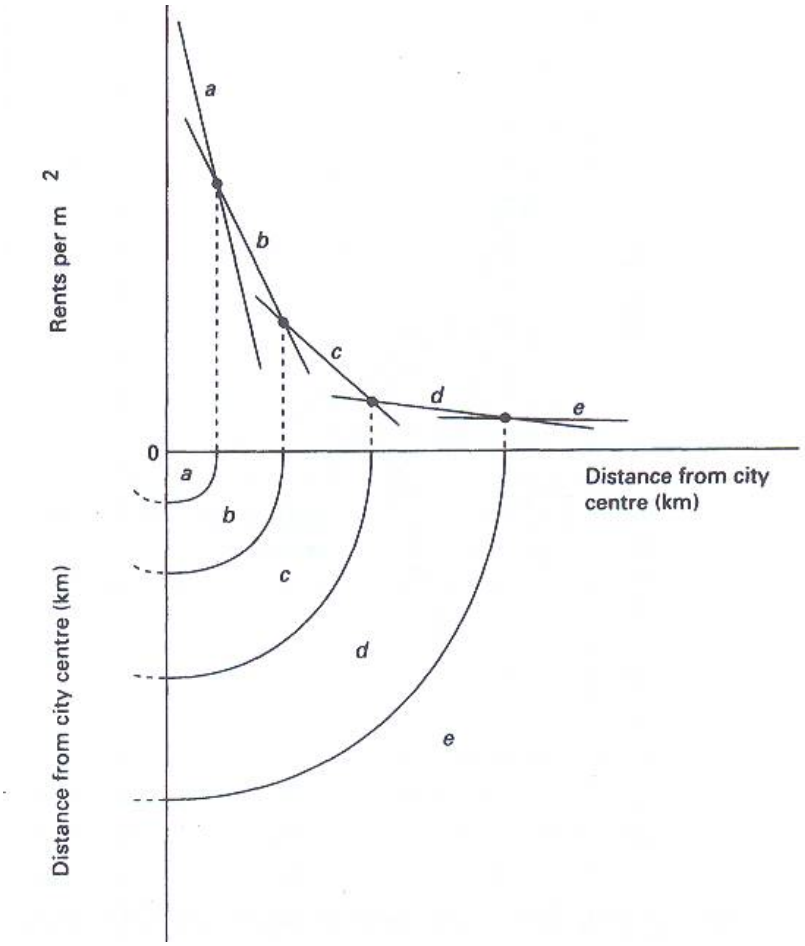
4.5.3 Alonso's Bid Rent Function

This is described by Alonso (1960) as :

> *Profit may be defined as the remainder from the volume of business after operating costs and land costs have been deducted. Since in most cases the volume of business of a firm as well as its operating costs will vary with its location, the rate of change of the bid rent curve will bear no simple relation to transport costs (as it did in agriculture). The rate of change of the total bid rent for a firm, where profits are constant by definition, will be equal to the rate of change in the volume of business minus the rate of change in operating costs. Therefore the slope of the bid rent curve, the values of which are in terms of dollars per unit of land, will be equal to the rate of change in the volume of business minus the rate of change in operating costs, divided by the area occupied by the establishment (op. cit., 1960).*

The Alonso bid rent model (1960) as depicted in Fig. 4.2 hereunder, is used as the basis for conceptualising a series of concentric rings based on patterns of outward urban growth.

Figure 4.2: The Alonso Bid Rent Model (1960)



Source: Balchin et al (2005)

As the demand for land or for property is derived and is intrinsically based on population or on employment pressures, rent is its factor reward. Rent reflects the balance of end-use demand relative to supply. The economic rationale that links land-use with transportation and that gives urban economics a spatial application, is expressed in the relationship of location and distance. One derived application of this theory, taken from the above Alonso (1960) rent-to-distance model, is shown in the first case study Settlement Distance from Dublin and Population Growth, in Appendix 7, of a similar population-to-distance analysis for various motorway routes, radiating outwards from Dublin over a twenty-year time dynamic 1986-2006. The reason for selecting this time frame is because it comprises the last ten years of the 'traditional' and a similar length period representing the 'recent' population growth trends as identified by the CSO.

4.6 Other Related Quantitative Issues Relevant to Thesis Hypothesis

This section consists of other individual quantitative aspects which are significant to this thesis and are additional to HYMOC model. These include the following items:

4.6.1 Zipf's Law Application to Irish Settlements

If considered in reverse, there appears to be a far stronger linear relationship between the most recent (2006) census when Cork recorded a population of 190,384 with Limerick at 90,757 which is somewhat under half Cork's size, and then Galway with 72,729 and finally Waterford's 49, 213. On that basis, should Dublin's population be of the order of just under 400,000? Urban Economic theory, including that of Zipf's Law (1949) enables the primacy of Dublin within all of Ireland to be compared with other countries and to measure Dublin with other Irish settlements. In the case of the Republic for example, Dublin (2006 Census) remains at more than five times the size of Cork. Interestingly in the all-Ireland context, there is somewhat less eccentricity, due to Belfast being over half of Dublin's population size.

In the European and international comparative context, Dublin is the State's only significant settlement (Thornhill, 2009). Its constituent elements of demographic growth based on the weight of evidence, all point to an absence of strategy alternatives, adduced in the following analysis of concentration. Urban Economic Theorist, Smailes (1944) suggests that in developed industrial countries, the rank size analysis should be linear in outcome. The greater the eccentricity, resulting in graphic concavity, the higher is the indication of primacy and the lower in development potential is a country's remaining urban structure. It is thus instructive to consider larger settlements in the context of primacy and population size.

With the gradual acceptance of spread-city morphology, currently it is of greater economic relevance to measure settlements in the context of their geographical SoI of employment, specifically including their effective commuter belt. Accordingly, the next Table 4.11 measures the State's cities against the above-stated Zipf's Law criterion, thus:

Table 4.11: Rank Population Size of Cities (RoI) per 2006 Census

City ('000)	Rank	2006 Population (a)	Where Dublin = 100.00	Zipf's Law Population (b)	Zipf Target Shortfall (b)- (a)	Zipf % extent of Shortfall [(b)-(a)/ (b)]
Dublin	1	1,045.8	100.00	1,045.8	0.0	100.00
Cork	2	190.4	18.53	522.9	332.5	63.59
Limerick	3	90.8	8.66	348.6	257.8	73.95
Galway	4	72.7	6.59	261.5	188.8	72.20
Waterford	5	49.2	4.65	209.2	160.0	76.78
Aggregate embryo city population shortfall in relation to Dublin:					939.1	69.97

Source: CSO *Principal Demographic Results*, Censuses of 2006: Table B. Analysis: Thesis Author.

Utilising Zipf's Law as the benchmark, it is instructive to contemplate the aggregate and percentage 'shortfall' of almost one million as per above Table for the populations of the embryo cities. Here there is a consistency in the percentage shortfall: i.e. from 63.59% to 76.48%, representing an aggregate 69.97%. This finding supports the view that for small countries or provinces, as in the cases of the Republic and of Northern Ireland, primacy is to be expected, simply based on the limited size of entity (Henderson, 1989). This is supported in research by Mansury and Gulyas (2006). So as to reduce such shortfall a policy initiative would seek to grow the embryo cities.

Accordingly, the next Table 4.12 shows a similar Zipf-type all-Ireland analysis incorporating this research's estimates for Belfast and Derry populations as at 2006, thus:

Table 4.12: Application of Zipf's Rank Population Size of Cities (all Ireland) in 2006

City ('000)	Rank	2006 Population (a)	Where Dublin = 100.00%	Zipf's Law Population (b)	Zipf Target Shortfall/ [Surp.] (b)- (a)	Zipf % extent of Shortfall [(b)-(a)/ (b)]
Dublin	1	1,045.8	100.00	1,045.8	0.0	100.00
Belfast	2	650.00	62.15	522.9	[127.1]	[124.31]
Cork	3	190.4	18.53	348.6	158.2	45.38
Derry	4	110.0	10.52	261.5	151.5	57.93
Limerick	5	90.8	8.66	209.2	118.4	56.60
Galway	6	72.7	6.59	174.3	101.6	58.29
Waterford	7	49.2	4.65	149.4	100.2	67.07
Aggregate embryo city population shortfall in relation to Dublin:					502.8	30.18

Source: CSO Principal Demographic Results, Censuses of 2006: Table B, together with author's estimates for Belfast and Derry and making the assumption that Waterford is the next largest settlement after Galway to the exclusion to any other settlement north of the border. Analysis: Thesis Author.
Note: The bracketed figures for Belfast are significant when viewed in the context of an all-Ireland economy. At face value they suggest that both Dublin and Belfast exhibit excessive primacy. However, the following analysis for the island's settlement population confirms a collective deficiency in the populations of its embryo cities.

Thus, in an all-Ireland context Belfast exceeds the Zipf rule by 24.31% and, together with addition of Derry as the island's fourth largest settlement, this analysis results in a seven-settlement Zipf percentage shortfall of 30.18% in a similar aggregated computation that likewise excludes Dublin.

This research reveals that like Dublin, Belfast in a Northern Ireland context is overly 'primate' in population. Nevertheless, when considered alongside Dublin in Table 4.12, this evidence-based analysis confirms the earlier intuitive observation: specifically as to the absence of 200,000 to 500,000 population-sized settlements throughout the island of Ireland.

In that context, the specific size-gap between Belfast and Cork, as shown in this table analysis, confirms the absence of a second tier in Ireland's settlement hierarchy. Additional confirmation of this significant research finding is shown in the similar proportionate size difference as between Dublin/ Cork and Belfast/ Derry of just 1.29%, i.e. Cork is 18.21% of Dublin's population as against Derry's 16.92% of Belfast.[29]

[29] Hence it is useful to consider Bogart (1998: 7-8) in relation to the economies of scale as they apply to city size: *When the average cost of production falls as a result of the increased total output of a product, we speak of the presence of economies of scale* (ibid). He describes how cost savings may be *internal* to the individual firm, industry or region, as appropriate to the size of the economic unit under analysis. Equally they may be categorised as *external* when a group of firms, industries or regions are contemplated. Bogart further notes how

4.6.2 Core-Periphery Considerations

Focusing into the future, chapter seven deploys the methodological approach of adducing pointers in support of the thesis hypothesis, including both national and international factors. In synthesising the research findings, there is a discussion of these factors and of current and past measures of government strategy direction assisted by additional Chapter 7 discussion based on O'Leary (2003) and other relevant literature.

4.6.3 The GDA and RoS Settlement Analysis

It is instructive to commence this quantitative aspect of the research with an historic investigation of settlements, already referred. This methodological approach commences with a brief historic analysis of urban population growth over the forty-years since the 1966 base year. The objective of undertaking this analysis is to obtain insights of past dynamics of growth which will assist in the construction of plausible thesis scenarios for future settlement growth in the GDA and RoS area. The changes that occurred are summarised in the following table and its associated commentary.

Table 4.13: GDA and RoS Settlements - Comparative Populations, Numbers of Settlements, City % Shares and % Growth 1966 and 2006

	GDA Settlements	RoS Settlements	GDA Numbers	RoS Numbers	GDA City % Share	ROS City % Share
2006	1,450,047	1,124,266	50	120	72.12	35.85
1966	814,976	604,088	22	81	90.18	35.29
40-year growth	635,071	520,178	28	39	-18.06	+0.56
% growth	77.93%	86.11%	127.27%	48.15%		

Source: Authors analysis of Table 7, Volume 1, 1966 and 2006 censuses

The following observations are noted form this analysis of the 1966-2006 period. The state's urban population grew from 1,419,064 to 2,574,313, an increase of 1,155,249 or 81.41%. The comparative rural growth was just 200,597 being 13.69%. Whereas in 1966 the GDA urban population was 33.25% greater than the RoS area, by 2006 that difference had reduced to 28.98%. Likewise, the numbers of settlements of 1,500 and

internal economies may be influential in the context of clustering of individual activities. On the other hand, external ones are fundamental to spatial proximity, referred to as agglomerations of scale. In turn, agglomeration economics *is fundamental to the economic expansion of urban growth* (ibid.). He advises however, that whereas clustering *per se* is economically beneficial, it must also be balanced by recognising the diseconomies of the ensuing congestion.

over in the state has increased from 103 to 170, or by 65.05%. The growth in the numbers of GDA settlements, particularly those of 10,000 and over, reflects Dublin's urban agglomerative effect in the expansion of its dormitory towns.

In analysing the growth of dormitory towns, is interesting to note how both Swords and Carrigaline, now the largest Dublin and Cork towns, had respective populations of only 1,892 and 772 in 1966, compared with 33,998 and 12,835 in 2006. Substantial changes occurred in the descending size-order of towns over forty years, particularly with a rapid growth of many Dublin SoI towns. This is evident in comparing individual 1966 populations of non-SoI provincial towns with their 2006 figure, where modest growth was generally the outcome.

Accordingly, Thurles, removed from the SoI of any city and the 18th largest town in 1966, had slipped to 54th place in the state's settlement rank order by 2006. Conversely, the former Meath village of Ratoath, with a population of 600 in 1966 and 7,249 in 2006, had nearly matched Thurles which was 7,682 in 2006. Ratoath's growth typifies the explanation for Dublin's dilution from 90.18% to 72.12% of the GDA urban population total, as some of that growth deflected to rapidly expanding dormitory towns, principally in the Mid-East region.

Of the total state population growth 1966-2006 of 1,355,846, urban growth comprised 1,155,249 or 85.21%. The corresponding state rural growth was 200,597 or 13.69%.

The next task in this historic review of settlements is the analysis of each region, individually. In disaggregating settlements into their respective size categories a detailed analysis of their contribution to growth, likewise, provides a spatial appreciation of overall growth dynamic. For the GDA, whereas Dublin had comprised 90.18% of the 1966 urban population, over the next forty years it contributed just 42.29% to the overall urban population growth. Bray was the sole large town in 1966 having a population of 13,668. Of greatest significance is that over the next 40 years in the GDA, a further 12 settlements that had grown to large towns of 10,000 and over, joined this category and together with Bray accounted for 36.42% of total urban growth. The three smaller categories contributed in aggregate just 14.64%.

Table 4.14: GDA Settlements – Populations in 2006 and 1966, Growth, Percentage Growth and Numbers of Settlements

	Total GDA Settlements	Dublin	10,000-plus towns	5,000 to 9,999	3,000 to 4,999	1,500 to 2,999
2006	1,450,047	1,045,769	244,978	95,877	33,432	29,991
1966	814,976	734,967	13,668	22,230	19,138	24,973
40-year growth	635,071	310,802	231,310	73,647	14,294	5,018
% growth	77.93%	42.29%	1,592.34%	231.30%	74.69%	20.09%
2006/1966 Numbers	50/22	1/1	13/1	13/4	9/5	14/11
% share of growth	100.00%	48.94%	36.42%	11.60%	2..25%	0.79%

Source: Author's analysis of Table 7, Volume 1, 1966 and 2006 censuses

The comparative analysis for the RoS area shows that there was an overall superior settlement growth rate of 86.11% compared with 77.93% for the GDA. In contrast, the GDA large and medium-sized towns performed much better than their RoS counterparts, principally due to the increased numbers of such settlements and the rapid growth of commuting towns.

Significantly, Dublin's share of population growth was over one-third greater than the RoS cities, contributing 48.94% as against 36.50% of the overall urban growth. Yet, the RoS cities grew by 89.06%; nearly twice that of Dublin's 48.94%. The explanation for this apparent paradox is the scale-size differential whereby in 2006, the contiguous Dublin settlement is nearly as populous as the aggregate RoS urban population, i.e. 1,045,769 versus 1,124,266. This was counterbalanced by a stronger RoS growth in the large town category, which accounted for 44.69% of total urban growth compared with 36.42% for the GDA towns over 10,000 in population.

Table 4.15: RoS Settlements - Comparative Populations, Numbers of Settlements, City % Shares and % Growth 1966 and 2006

	Total RoS Settlements	Cities	10,000 Plus	5,000 to 9,999	3,000 to 4,999	1,500 to 2,999
2006	1,124,266	403,083	370,947	176,836	75,123	98,277
1966	604,088	213,207	138,499	100,454	69,605	82,323
40-year growth	520,178	189,876	232,448	76,382	5,518	15,954
% growth	86.11%	89.06%	167.83%	76.04%	7.93%	19.38%
2006/1966 Numbers	120/81	4/3	21/9	26/15	20/17	49/37
% share of growth	100.00%	36.50%	44.69%	14.68%	1.06%	3.07%

Source: Author's analysis of Table 7, Volume 1, 1966 and 2006 censuses

Despite these significant findings obtained from this settlement analysis, in itself, it does not provide a comprehensive spatial picture of demographic growth comparisons since 1966. Accordingly, in order to enhance the investigation, the 'history' analysis examines regional performances, thereby including the rural as well as the urban population. The methodology is similar to the approach taken in NESC 102 (1997).

The methodology herein deployed is based on the current NUTS 3 Planning Regions which are somewhat different to their original county compositions of 1966, as was followed in that NESC study.[30] In using this start date and observing the same time frame as for the settlement analysis, their respective regional populations are tabulated for ease of comparison.

Likewise the population growth and percentage increases are computed. Also, all regions' 1966 and 2006 percentage shares of state population are shown. Consistent with the thesis hypothesis, the GDA and RoS area data also are displayed, in bold, as set out in the following table:

[30] So as to provide for a comparable base in comparing the 40-year population movements, they are based on the current Planning Regions. Accordingly, Roscommon is included in the West Region whereas in 1966 it formed part of the Midland Region.

Table 4.16: Regional Population Historical Analysis - 1966 and 2006

Region	1966 Pop.	2006 Pop.	Pop. growth	Pop. % increase	Pop. % share in 1966	Pop. % share in 2006
Dublin	795,047	1,187,176	392,129	49.32%	27.57%	28.00%
Mid-East	194,155	475,360	281,205	144.83%	6.73%	11.21%
GDA	**989,202**	**1,662,536**	**673,334**	**68.07%**	**34.30%**	**39.21%**
Border	359,657	468,375	108,718	30.22%	12.47%	11.05%
Midlands	178,201	251,664	73,463	41.22%	6.18%	5.93%
Mid-West	264,797	361,028	96,231	36.34%	9.18%	8.52%
South-East	319,542	460,838	141,296	44.22%	11.08%	10.87%
South-West	452,488	621,130	168,642	37.27%	15.69%	14.65%
West	320,115	414,277	94,162	29.42%	11.10%	9.77%
RoS	**1,894,800**	**2,577,312**	**682,512**	**36.02%**	**65.70%**	**60.79%**
State	2,884,002	4,239,848	1,355,846	47.01%	100.00	100.00

Source: Author's analysis of Tables 2 and 4, Volume 1, 2006 census

This regional analysis shows that Dublin and the Mid-East regions both increased population share at the expense of all six RoS regions. This confirms that over this time period, the four 'embryo' cities were unable to generate agglomeration momentum or spin-off effect to match the growth percentages of the Dublin region, and in addition, in the way it has contributed to accelerating the growth of the adjacent Mid-East region whilst also modestly increasing the capital region's share of state population. Accordingly, a policy issues that arises from this analysis is the important question of 'future governance'. Together with other findings, they are considered in Chapter 7.

4.6.4 A 40-year review of Ireland's changing employment

The thesis focus on demography is based on the premise that population growth is significantly influenced by employment as a 'first mover', particularly for Ireland because it is an offshore island to countries having larger populations, population densities and major settlements. Accordingly, the composition of employment over the 40-year time-scale since 1966 combined with the nature and change of 'work' and the spatial consequences arising from the structural changes to its labour force are central to the understanding of the demographic dynamics of the state and as the background to

the prospective direction of the 'new economy' into the future. These employment changes are analysed in the following table, thus:

Table 4.17: 1966-2006 compositional change, growth, percentage growth in employment and sector share of people-at-work

Sector	1966 Employment	2006 Employment	40-year Growth	1966 % Share	2006 % Share	40-year % Growth
Agriculture	342,832	114,500	-228,332	32.16	5.68	-66.60
Industry	284,428	551,200	266,772	26.68	27.33	93.79
Services	438,727	1,351,200	912,473	41.16	66.99	207.98
Total	1,065,987	2,016,900	950,913	100.00	100.00	89.20

Source: CSO Census 2006 and Marie Hogarty, CSO, Swords Office. Analysis: Thesis author

This table analysis confirms the 89.20% increase in the 'at work' total as compared with the 47.02% corresponding increase in population over the same 40-year period.

However, such employment growth tends to mask the enormous structural changes that also have occurred, both in employment composition, in the technology-skill advances in 'work' itself and particularly in the growth of female employment. Over this 40-year period females accounted for 60.95% of the 950,913 total additional 'at work' population. Their share increased from 25.85% of employment in 1966 to a 42.38% by 2006. From this examination of the major structural change in employment an appreciation is obtained of its spatial implications, particularly in the concentration of work in to the urban environment. There is a city employment focus, particularly for Dublin which dominates the GDA spatial distribution of employment.

In completing this brief employment analysis, it is instructive to comment on some recent trends in employment; ones that may have spatial significance for future trend-paths.

4.6.5 Significant Recent Economic Trends in Employment

One particular, current, concern and the subject of an ongoing CSO analysis is a near 30% decline in the agriculture sector's employment since 2006.[31] This is almost treble the percentage loss experienced by other employment sectors, indicative of a recent

[31] Since the 2006 census, the loss in this sector has been almost 30% with the sector's total now down to the 80,600 level (*vide* QNHS, 15th June 2010).

acceleration in the pace of agricultural rationalisation. It has yet to be determined to what extent this may impact on the RoS area which comprises an 87.40 % share of the state's non-nucleated population (Williams, Hughes and Redmond. (2010a, Table 2). However, this research reinforces recent commentary, to the effect that rural areas will need to broaden their employment base in order to retain economic viability, addressed hereunder. This has considerable future spatial consequence for regions with a weak urban base.

Additional analysis for post 2006 employment trends also confirms that given its percentage size, the services sector has incurred the highest number of job losses during this recession. Counterbalancing this trend is a steady stream of mainly high-tech FDI set-up or expansion 'announcements' by the Industrial Development Authority (IDA), particularly since mid-2009. Significantly, this recovery is commencing primarily in Dublin and also in Cork with some Galway and other location FDI announcements. This trend-pattern is an emerging spatial one for what appears to be 'two-tier' trend in employment creation, evidenced in FDI exports and in the pace of growth as between FDI and the lagging domestic-SME sectors.[32]

The CSO data from its Quarterly National Household Survey (QNHS) confirms since 1996, that the GDA share of employment continues at about 1.5% above its population share. Accordingly, it is instructive for the thesis hypothesis to consider whether this trend will continue and as a consequence, to where the future 'at work' spatial emphasis will be focused.

Here there are similar 'echoes' of the circumstances that pertained over four decades ago, perhaps under different types of 'work' – with the services sector now being dominant in place of agriculture and industry - having the same background observations (*vide* Third Programme for Economic and Social Development, 1969). In 1969, associated with the completion and publication of the Buchanan Report, some influential sources provided insightful, related commentary, including the government's Third Programme (1969) and Fitzgerald (1969). These are detailed in the policy component of the second next chapter.

[32] Irish FDI-type investment continues to increase and over the five years inclusive 2005-2009 amounted to €571.6 billion generating an income of €98.1 billion. Source: US Bureau of Economic Analysis.

4.6.6 The Spatial Distribution of Residential Zoned Land

The current review and update of the Regional Planning Guidelines and likewise of individual County Development Plans presents an opportunity for government planners and strategists to rationalise the existing quantum and proportional distribution of zoned land for residential purposes. This could accommodate the need for a change to the spatial strategy focus toward city-led centripetal growth. Likewise, it serves the task of rectifying over-zoning decisions, especially in rural counties, and in tightening development land supply in the direction of growth centres. The results of such decision-making will inform the policy-direction for future residential land allocations and will demonstrate the official approach to Ireland's strategic development.

As the province of Leinster has 54.13% of state population, it represents the most important population share and residential zoning content for a number of Ireland's planning regions. The pre-review position, analysed herein amplifies the results of existing development strategies and their residential zoning decisions, as set out in the following comparison with provincial population and existing residential zonings and total surface area, thus:

Table 4.18: 2006 Population, Share of Zoned Land (Ha) and Surface Areas (Ha) and Corresponding Percentages

County	Population	Zoned Land	Areas	% Pop.	% Zoned	% Area
Dublin	1,187,176	3,185	92,066	51.73	21.31	4.66
Mid-East	475,360	3,513	606,134	20.71	23.50	30.65
GDA	1,662,536	6,696	698,200	72.44	44.81	35.31
Rest of Leinster	632,587	8,252	1,279,223	27.56	55.19	64.69
Total Leinster	2,295,123	14,948	1,977,423	100.00	100.00	100.00

Sources: Dublin City Council internal data and published data on quantum of land-zoning, McDonald and Sheridan (2010). Analysis: Thesis Author

The results from this summary analysis confirms for Dublin, modest quantities of zoned residential land and small surface area compared with that region's population. Furthermore, the Mid-East region's share of zoned land is proportionate with its population and surface area. Likewise, the GDA composites are reasonably proportioned

for the three criteria. However, the Rest of Leinster counties possess more than half of all Leinster's zoned land despite comprising just over one-quarter of the provincial population.

This finding provides and explains the supply-side rationale for the rapid housing construction activity that has taken place since 1996. The complementary demand-side-push momentum arose from the population 'deflection' due to unaffordable housing, as the evidence of out-migration in the Dun Laoghaire-Rathdown case confirms.

The next table contains a similar analysis at the individual county level, including the Dublin's administrative counties. It confirms that the skewed-share in zoned land favours the Mid-East over Dublin but, in turn, this distortion is magnified ever more so for the Rest of Leinster counties. Likewise, these data confirm the disproportionate current shares of residential zoned land for such Leinster counties when compared with their modest share of total population. Laois appears to be a particularly extreme case of a sparsely populated county having an unusually high percentage of zoned land. Not unsurprisingly, it has been the subject of ministerial intervention, as detailed below.

The data from this table were also subjected to correlativity analysis. In comparing their individual populations with aggregate zoned land, the correlation was shown to be just 0.25, which is highly negative. Significantly however, the zoning of residential land with county surface areas is substantially more correlated at 0.55, reflecting the zoning pressure exerted by rural-based counties in their endeavours to capture a disproportionate share of current and future development.

This methodology confirms the negative correlation as between population and land zoning and thereby providing compelling evidence of the extent of strategy implementation which appears to facilitate dispersed, centrifugal morphological development, thus:

Table 4.19: Leinster Counties' 2006 Population, Zoned Land (Ha), Surface Area (Ha) and Corresponding Percentage Share

County	Population	Zoned Land	Areas	% Population	% Zoned	% Share
Dublin City	506,211	460	11,761	27.06	3.08	0.59
DLR	194,038	685	12.695	8.45	4.58	0.64
Fingal	239,992	1,260	45,309	10.46	8.43	2.29
South Dublin	246,935	780	22,301	10.76	5.22	1.13
Kildare	186,335	1,181	169,420	8.12	7.90	8.57
Meath	162,831	1,700	233,454	7.09	11.37	11.81
Wicklow	126,194	835	203,260	5.50	5.59	10.28
Carlow	50,349	408	89,790	2.19	2.73	4.54
Kilkenny	87,558	700e	207,169	3.81	4.68	10.48
Laois	67,059	1,678	171,946	2.92	11.23	8.70
Longford	34,391	910	109,125	1.50	6.09	5.52
Louth	111,267	948	83,199	4.85	6.34	4.21
Offaly	70,868	1,044	198,981	3.09	6.98	10.06
Westmeath	79,346	977	182,486	3.46	6.54	9.23
Wexford	131,749	1,382	236,527	5.74	9.25	11.96
TOTAL	2,295,123	14,948	1,977,423	100.00	100.00	100.00

Sources: Dublin City Council internal data and McDonald and Sheridan (2010), Analysis: Thesis Author

Note: Kilkenny is omitted from McDonald and Sheridan (2010); it is shown as author's estimated figure 'e'.

This supply-led zoning intervention appears unwarranted, given the historical absence for such city-scale housing end-use demand, exacerbated by the prevailing levels of surplus housing stock (Hughes, 2010). From the strategy perspective viewpoint, the need for outgoing DoEHLG policy objective to reverse the 'scattergun' zoning is likewise confirmed in McDonald and Sheridan (2010). This literature cites the contrasting outcomes of County Laois and the commuter Wexford town of Gorey.

Laois is already identified, as having been the first cases of ministerial intervention, which led to the quashing of the Laois County Development Plan in 2006. Earlier, in 2002 the case of Wexford commuting town of Gorey, despite its extent of over-zoned land by a factor of ten, the Minister had refused to intervene in that instance (McDonald and Sheridan, 2010).

Coupled with other examples of dispersed development in rest of Leinster counties, there has been a marked absence of official intervention to densify development that might have reduced long-distance commuting, thereby facilitating sustainable development. The extract from the Examiner newspaper is just one of several typical recent reports which serve to demonstrate resistance and de-zoning by confusing 'supply' with 'demand' rationale. In turn, it points to the presence of widespread 'vested interests' opposed to policy strategy favourable to sustainable development.

Evidence of Resistance to Rezoning – The Examiner

Dezoning proposal 'counter-productive'

by Gordon Deegan

ONE of the largest developers in the mid-west has warned the Mid-West Regional Authority that a proposal to dezone vast tracts of land in the region is counter-productive and should not be entertained.

As part of the Mid-West Regional Authority's draft regional planning guidelines 2010-2022, the authority has stated that due to the considerable excess of land zoned for housing development in the region, planning authorities should examine whether there are areas of land that should be dezoned.

A study carried out by the regional authority found that a third of the land zoned for housing in the mid-west is zoned in the greater Ennis area having the potential for the construction of 45,000 houses.

Currently, Clare County Council and Ennis Town Council are in the process of "freezing" areas for development in the greater Ennis area after the Department of Environment raised concerns.

In a submission to the regional authority, Declan White of the Limerick-based Chieftain Group claimed that "de-zoning certain lands, which more than likely would have been purchased at excessive prices, will no doubt lead to much frustration in the development sector".

Mr White states that if such action was taken "many developers would lose much needed equity from their portfolio, which will inevitably lead to added financial strain with the banks".

He adds: "We contend that such a proposal of de-zoning certain lands is counter-productive and should not be entertained."

Prior to the findings of the ministerial investigation into possible corruption or of decisions to reverse residential zonings, it is instructive to conclude this section by undertaking a review of the supply and demand housing implications for Leinster relating to the near-15,000 hectares of land so zoned. Assuming a medium density of 20 units per hectare this provides a supply potential of 300,000 units.

On the basis of a resumption of economic growth and moderate in-migration, it is estimated by this research that this is equivalent to about 12 years of demand for this province. No judgement is made as to individual city or county-level allocations. On top of this timeframe is a current state oversupply of about 5 years. Therefore, a total of 17 years supply could be provided. This is almost twice what is required so as to cover a full development plan timeframe plus 50%, equivalent to 9 years. This informs the conclusion that on the hypothetical assumption of the economy's recovery, Leinster's aggregate residential zoning requirement should be 5,000 instead of the 15,000 hectares so zoned. This evidence-based research was undertaken so as confirming the public policy thrust in favour of supply focused, county-led development which appears to be inconsistent with the emerging significant recent economic trends in employment, discussed earlier.

4.7 Conclusions arising from Other Related Quantitative Considerations

The subject areas investigated above, in the final section of this quantitative chapter, provides the research evidence to support the thesis hypothesis and has clarified the range of time horizons within which population convergence between the GDA and the RoS area might be expected to occur. The application of the HYMOC model confirms that the 'traditional' growth Basis Points spread favouring the GDA over the RoS area as having been the normal one, with the exception of the unusually prosperous 1996-2006 period when exceptional economic conditions prevailed. It has also been shown that strategic spatial decision-making appears to have been premised on the basis that Ireland's recent unprecedented growth would continue indefinitely.

The last element of the thesis methodology, the qualitative aspects, is addressed in the next chapter. It helps to clarify the overview that is held by the senior personnel who were interviewed, as to the thesis hypothesis and its prospective consequences for the

state’s population, its growth and spatial distribution and importantly, for the five key issues addressed.

CHAPTER 5 – QUALITATIVE METHODOLOGY

This chapter comprises the qualitative aspects undertaken the thesis research. The objective was to inform the research of a wide-ranging set of attitudes and opinions that relate to the thesis area and specifically to its hypothesis.

This chapter consists of the following sub-sections:

5.1 Details of the Methodological Approaches to the Qualitative Research

In identifying the principal 'Driving Forces of Change' of the contemporaneous *Twice the Size* (2008) research project, it specified a 5-Sector approach based on Demography (**D**). They are Society (**S**), Economy (**Econ**), Governance (**G**), Technology (**T**) and Environment (**Env**). The forty two single or multiple subject dialogues were conducted by this research at three levels as shown and likewise focused on one of these six coded areas or where multiple sectors (**M**) were discussed. Although applying the same methodology, it is noted that thesis writer's discussions and interviews were made over a wider time span and were independently conducted of the *Twice the Size* (2008) study. These six interlinked major determinants are also identified as being critically linked to the thesis author's eighteen strategic areas of investigation, thus:

Figure 5.1: Areas of Strategic Investigation and Discussants

Strategic Areas Investigated		Semi-Structured Interviews	In-depth Conversations	Strategic Discussions
Research Strategy	**M**	Brendan Williams (1)	Ella Krawczyk (2)	
Governance - Detail	**G**	John Tierney (3)	John Fitzgerald (4)	Niall Cussen (5)
Demography	**D**	Aidan Punch (6)	Deirdre Cullen (7)	Gerry O'Hanlon (8)
Spatial Planning	**Env**	Conor Skehan (9)	Henk van der Kamp (10)	Mary Moylan (11)
Scale Issues	**M**	John Ratcliffe (12)		
Morphology and Density	**Env**	Rick Peiser (13)	Frank McDonald (14)	John Worthington
Core-periphery Debates	**M**	Seamus Caulfield (16)		Bruce McCormack (17)
The Future Ireland	**S**		Clayton Love Jnr.(18)	Ken Whitaker (19)
Technology and Work	**T**		Eddie O'Connor (20)	Verner Kruckow (21)
Convergence Modelling/Research Methods	**T**	Frank McCann (22)	Anselem Griffin (23)	John Boland (24)
Real Estate and Housing	**S**	Rod O'Beirne (25)	Patrick Shiels (26)	
Transportation	**T**	John Henry (27)		Michael McNicholas (28)
Commerce and the Economy	**Econ**		Ronan King (29)	Colm McCarthy (30)
Industrial Clustering	**T**		Helen McGrath (31)	Paid McMenamin (32)
Futures and Local Government	**G**		Edward Corrigan (33)	Fergus Keelin (34)
Cartography and Geomatics	**T**	Patrick Prendergast (35)		Dermot Corcoran (36)
Economic cycles/Trends	**Econ**		Antoin Murphy (37)	David McWilliams (38)
New Economic Geography	**D**		Edgar Morgenroth (39)	
Innovation and Manpower	**T**		Philip Lunn (40)	
In-migration	**D**			Peter Sutherland (41)
Housing and Planning	**D**	Michael Gough (42)		

Note: The bracketed numbering assists in designations and roles for the interviewees. The Matrix Spreadsheet layout identifies the twenty-two Strategic Areas for Investigation on the X-axis and thesis author's three levels of interface on the Y-axis with thirty-nine interviewees – their designations, which are detailed in the next section – were considered to be strategic sub-components of the six major urban Agglomeration determinants for the specific thesis subject. The 'Note' references above to McCann, Griffin and Boland are to discussions relating to the Quantitative aspects and advice of thesis author's research conducted with DIT lecturing

colleagues. Likewise, consultations on cartography and urban densities are attributed to Prendergast and Corcoran (CSO), respectively.

5.2 A Review of the Thesis Research Methodology and related Theoretical Components

The theoretical component informing the methodological approach to this thesis is based on the considered views of experts in demography and its related fields, to senior policy-makers, managers and administrators. Likewise, to ascertain the possible differing policy options. In particular this author is grateful to the Central Statistics Office (CSO) for providing methodological insights by way of unpublished Stock Analysis including Migration Flows and movements, both external and internal.

5.3 Consideration of Ethical Requirements

In implementing a strategic approach to the qualitative methodology aspects of subject thesis it was viewed that the recommendations favoured in Babbie (2007) and likewise in Murphy (2009) should be closely observed. These approaches include strategies to address human inquiry and science, paradigms, theory and social research and the ethics and politics of social research. Parallel to the qualitative methodological approach and subject to space and time limitations, quantitative applications to major areas of inquiry, likewise, were undertaken. These included an evaluation of the population projections adduced by the CSO's expert group and the conflicting ones of the DoEHLG, author's HYMOC model formulation and its testing and verification process, a settlement and density analysis, appropriate and relevant case studies and cross-analyses where deemed appropriate.

Thus both qualitative and quantitative approaches were undertaken in parallel and in close consultation with this author's supervisors and likewise with the recommendations of the internal reader. In particular, the overall objectivity of the research inquiry has been to ensure that whatever future scenario eventuates, the inquiry will have been sufficiently flexible to accommodate the variables to be expected of an offshore island with all its possibilities and its characteristic swings from 'boom' to 'slump' propensities.

5.4 The Methodological Approaches to the Qualitative Research

The approaches were influenced by: Anne Murphy's (2009) DIT paper together with the *Epistemology* Ch. 6 ref to Knight and Turnbull (2008) Complementing the thesis main research area on quantitative demographic analysis, the evidence-base research focus is reinforced by a complementary programme for 'targeted' qualitative research based on semi-structured interviews and occasionally, on less formal discussions. These interviews were in most instances conducted independently of author's parallel work on the Futures Academy *Twice the Size* research project

The targeted interviewees were selected based on their general or specific expertise in six related areas/ topics. Often, the interviewees might have had responsibility for or had significant input into policy formulation. Provided the 'panel' for each area was sufficiently large, individual opinions would be 'masked' whilst the output of the interviews would still give valuable insight in the related areas/ topics.

In every encounter, the author described the thesis aim and its principal objectives. To each interviewee it was explained that the main objective was to draw on their specialisation or experience; and in specific cases where appropriate, to support or otherwise the quantitative data and findings. Given the thrust of the quantitative research evidence interviewees were asked for their expert opinion on issues within their fields and later in the interview, to rationalise such opinion(s) to the general.

The author took into account the experience gained from participating in the *Twice the Size* (2008) research project which had identified the principal 'Driving Forces of Change' for Dublin and the GDA. Accordingly, for the qualitative research of this thesis, a 6-Sector approach based on the principal thesis-medium of Demography (**D**) was adopted. The additional five are: Society (**S**), Economy (**Econ**), Governance (**G**), Technology (**T**) and Environment (**Env**). Forty two single or multiple subject interviews were conducted by at three levels of intensity, as shown in the following Schedule and likewise focused on one of these six coded areas or where multiple sectors (**M**) were discussed. These six interlinked major determinants are also identified as being critically linked to this research's eighteen strategic areas of investigation, thus.

5.5 Details and Designations of Interviewees and Discussants

(1) Dr Brendan Williams, UCD, Subsidiary Supervisor on subject thesis

(2) Dr Ella Krawczyk, DIT and Manager of the Twice the Size Research Project

(3) John Tierney, Dublin City Manager and Chief Executive GDA Regional Authority

(4) John Fitzgerald, Former Dublin City Manager and Chief Executive Limerick Regeneration

(5) Niall Cussen, Chief Planning Officer, DoEHLG

(6) Aidan Punch, Director of Census, CSO

(7) Deirdre Cullen, Senior Statistician, CSO

(8) Gerry O'Hanlon, Director General, CSO

(9) Conor Skehan, Head of Spatial Planning Department, DIT

(10) Henk van der Kamp, Head of School of Spatial Planning, DIT

(11) Mary Moylan, Assistant Secretary of DoEHLG

(12) Prof. John Ratcliffe, Lead Thesis Supervisor and Director of Faculty of the Built Environment.

(13) Prof. Rick Peiser, Chair and Head of Harvard Graduate School of Design, Mass., USA

(14) Frank McDonald, Environmental Editor, *Irish Times* and Author

(15) John Worthington, Partner DEGW and Consultant on Height to Dublin City Council

(16) Emeritus Professor Seamus Caulfield, UCD, Associate Supervisor to thesis author

(17) Bruce McCormack, member of CSO Expert Group, DoEHLG

(18) Clayton Love, Jnr. Industrialist and Financier of the Cork Study

(19) Dr Ken Whitaker, Ireland's First Citizen of the 20th century, former Secretary of Dept. Finance

(20) Dr Eddie O'Connor, Founder of Airtricity Ireland

(21) Dr Verner Kruckov, Chief Executive, Siemens, Ireland

(22) Frank McCann, Lecturer in Mathematics, DIT

(23) Anselem Griffin, Lecturer in Mathematics, DIT

(24) John Boland, Lecturer in Research Methods, DIT

(25) Rod O'Beirne, Chartered Surveyor and Managing Director, Chartered Properties

(26) Patrick Shiels, Academic Researcher and Author

(27) Michael McNicholas, UCD and Traffic Management Consultant

(28) John Henry, Chief Executive, Dublin Transportation Authority

(29) Ronan King, Past President, Dublin Chamber of Commerce
(30) Dr Colm McCarthy, author's former economics lecturer and Chairman An Bord Snip
(31) Dr Helen McGrath, DIT Lecturer and Author
(32) Paid McMenamin, former Senior Executive, IDA
(33) Edward Corrigan, DoEHLG
(34) Fergus Keelin, DoEHLG
(35) Dr Patrick Prendergast, Geomatics Dept., DIT
(36) Dermot Corcoran, Geography Section, CSO
(37) Prof. Antoin Murphy, Monet Prof. of Economics, TCD
(38) David McWilliams, Economist, Broadcaster and Author
(39) Edgar Morgenroth, Senior Research Officer, ESRI
(40) Philip Lunn, Research Officer, ESRI
(41) Peter Sutherland, Former EU Commissioner, (formerly) Chairman BP and current Chairman of Goldman Sachs (International)
(42) Michael Gough, Former Director of Economic Development and Planning, Dun Laoghaire-Rathdown County Council

5.6 Summary of Interviews

Results from these series of selected interviewees, targeted so as to elicit attitudes to six critical subject-heads are shown here. The objective was to maintain the traditionalist approach despite the risk of lower growth and lower in-migration contrasts with the progressive but unknown future that proponents viewed as adventurous. The outcomes of the 6-sector approach to the thesis qualitative research reflect the following findings of contrasting views.

5.7 Findings from Qualitative Discussions

One of the central objectives in conducting high-level interviews for subject thesis was to ascertain the contrasting outcomes that might result from broadly maintaining existing policy direction of balanced regional development and the alternative adoption of a fresh NEG-based paradigm with Pareto Optimality vision, under six broad themes (Y-axis, in bold) that are central to the thesis hypothesis, thus:

Figure 5.2: Summary of Listed Issues

Theme	Centre versus Periphery Approach - Present Policies Maintained, after O'Leary (2003)	Positive-Sum Game Pareto Vision - A new paradigm of agglomeration, following NEG
Demography	Dublin cannot compete globally	Dublin can compete globally
Outcome	No other centres populate rapidly	Fosters second-tier agglomer. growth
Society	A conscious urban/ rural balance	Urban influences dominate
Outcome	Focus on city/ town growth	Regional city spin-off
Economy	Dublin subsidises planning regions	Economically viable regions emerge
Outcome	Assures low economic growth rate	Agglomeration growth commences
Governance	Maintain strong central government	Regional co-ordination
Outcome	Continue with county system	City-based regional authorities
Technology	Acceptance of diseconomies of scale	Both competitive and innovative
Outcome	Continued risk of being uncompetitive	Assisting competitive clustering
Environment	Maintaining rural population	East-coast concentration
Outcome	Facilitates one-off rural housing	Strict green-belt policy

Source: Thesis Author

5.8 Conclusions arising from Qualitative Analysis Findings

The severe economic downturn and its prospective elongation occurred after completion of most of the conducted interviews. Accordingly the overview of Ireland's prospects was generally optimistic. Yet, a sense of conservatism was evidenced in many of the discussions. Dublin's primacy was raised by a number of discussants although there was only a limited consensus as to the need for proportionately larger cities elsewhere. The strategy for BRD received widespread support and likewise the view that population growth should in future be more evenly spread: this consensus would tend to favour the 'Recent' growth trend over the 'Traditional' one into the long-term. It is perceived as a fairer outcome.

Thus there was limited appreciation of the benefits of agglomerative-driven cities of a second-tier order and the objective to achieve concentrated population density did not feature in the minds of many. Maintaining Ireland's 'green' image was often raised and likewise the reduced need for the motor car. Access to finance for house-purchase was raised in a number of interviews and population deflection from high-value areas was generally accepted as being an inevitable outcome. More interviewees than not,

disagreed that Dublin would or should grow at a faster rate but the majority view was that the surrounding counties would continue to enjoy rapid growth from its 'spill-over' effect. Although recognised, the sustainability of long-distance commuting and regional-level sprawl were not viewed as long-term issues because as towns grew, it was felt that they would automatically attract more employment.

Finally, the above somewhat inconclusive picture emerging from this body of qualitative research in respect of the pivotal research question leads to the need for a more detailed examination of future possible scenarios in its defence. Accordingly, the following chapter pursues an issues route in the same structured order as was addressed in the layout of the literature review.

CHAPTER 6: ANALYSIS AND DISCUSSION ON THE FIVE KEY ISSUES

Having conducted an extensive although somewhat inconclusive Literature Review, and with the development and application of the HYMOC model, with resulting findings/ analysis, and the further quantitative chapter on related issues of relevance to the thesis hypothesis, this analysis chapter centres on five key issues which address the pivotal question "Is the GDA going to grow to the same size as the Rest of the State (RoS), and if so, when might this occur?"

The key issues under examination are:

1 - Imperatives of Scale

2 - Town Size and Urban Hierarchy

3 - Economic trends and spatial characteristics

4 – Past / present public policy and their outcome

5 - Future public policy direction

6.1 Analysis of Issue 1 - Imperatives of Scale

The following scale-issue subjects to achieve competitiveness in the context of globalisation are considered in this section

6.1.1 Urban and Regional Density

6.1.2 Rural to Urban Demographic Momentum

6.1.3 Components of Population Growth

6.1.4 The Policy Issues applied to Dublin and the GDA

6.1.5 Recent CSO Population Releases, Estimates and Projections

6.1.1 Urban and Regional Density

The cost of running the state requires consideration to be given to service provision. Examples such as transport cost, utilities, health or education provision by the state itself right down the cost incurred at the individual citizen level can vary significantly, dependent on remoteness and density defectiveness. Such consideration has magnified as a policy issue especially since the turn-around in the country's finances post- 2007.

Since then, the National Debt has nearly trebled as has the level of unemployment. As an imperative of scale there are every-day examples of politically-sensitive attempts by government to cost-rationalise. Post Office closures, rail-line routes or concentration of hospital cancer treatment specialisation outside of the GDA are just a few examples arising from low densities at a time of budgetary constraints. In the absence of cities or large towns, such cost disadvantage is magnified as is highlighted in the following evidence-based historic analysis of State, GDA and RoS population densities, thus:

Table 6.1: Regional Population Densities per Square Kilometre, 1966-2006

Census	GDA	RoS	State
1966	142	30	41
2006	238	41	60

Source: Thesis author's analysis based on CSO 1966 and 2006 Censuses

Whereas the GDA was 3.5 times as dense as the RoS area in 1966 the comparative density gap had widened to 5.8 times by 2006, with the significant implications for reduced competitiveness and economic disadvantage. Had that 1966 multiplier been maintained, the 2006 RoS population, pro-rata would have reached 3.175 million instead of 2.577 million, a shortfall of 17.83% or almost 600,000.

A deeper analysis using county populations demonstrates this forty-year lag in the RoS area population since 1966 when compared with the GDA. The cause of the RoS area lag is due principally to an insufficiency of centripetal-driven agglomeration, in turn resulting from the absence of medium-size city population scale and city-led growth in that area.

This is demonstrated in the following methodology which compares South-West and Mid-West regions with the GDA through an examination of population growth at the county level. Both of these RoS planning regions were selected because their principal cities and spheres of influence are Cork and Limerick, the second and the third largest settlements in the state over 1966-2006. In the first instance this comparison analysis is made in the absence of Dublin so as to demonstrate the particular influence that Dublin has had on the Mid-East region compared with the corresponding population growth

influence that Cork has had on the South-West and Limerick on the Mid-West region counties, respectively:

Table 6.2: Mid East, South-West and Mid-West County Growth Comparison – 1966-2006

Region	1966	2006	Pop. Growth	% growth
Mid-East:				
Meath	60,428	162,831	102,403	169.46%
Kildare	67,323	186,335	119,012	176.78%
Wicklow	66,404	126,194	59,790	90.04%
Regional Total	194,155	475,360	281,205	144.84%
South-West				
Cork	339,703	481,295	141,592	41.68%
Kerry	122,785	139,835	17,050	13.89%
Regional Total	452,488	621,130	168,642	37.27%
Mid-West				
Limerick	137,357	184,055	46,698	34.00%
Clare	73,597	110,950	37,353	50.75%
Tipp. N.	53,843	66,023	12,180	22.62%
Regional Total	264,797	361,028	96,231	36.34%

Source: Thesis author's analysis based on CSO 1966 and 2006 Censuses

This analysis confirms that the Mid-East regional percentage growth was nearly four times that achieved by either of the other regions. For the GDA as a whole when Dublin is added, the growth difference is diluted to just under twice that of the other regions, due to the fact that Dublin itself only grew by 49.32 % over that period. This is because of population deflection to the Mid-East region and to its substantially lower in-migration, issues already discussed. Even so, this evidence-based analysis confirms superior population growth, attributable to the agglomerative effect of Dublin, a city of intermediate size when compared with Zipf's Law classification of Cork and Limerick, third-rank in the tier of settlements of sub-ESDP city population scale. Furthermore, there is evidence to show Dublin's SoI is a gradually extending one, no longer confined to the GDA.

Had the Buchanan Report's main recommendations been implemented, with Cork growing to its 250,000 'target' by 1986 and Limerick (plus Shannon) to 175,000 by then, given the state population growth 1986-2006, it is shown pro-rata, that the growth

of Cork plus Limerick cities together would have contributed 420,000 of the 'missing' 600,000 people, identified *supra*. Significantly, on that basis Cork and Limerick (plus Shannon town) cities would have reached 475,000 and 225,000 populations by 2006.

The rejection of the Buchanan policy strategy was the crucial policy decision, in the failure of the state's settlement hierarchy to have two identified cities of a second-tier Zipf order in the RoS area urban hierarchy. This is confirmed by the fact that the state's overall population in the 1986 census had comfortably exceeded the 3.5 million population total as had been projected by Buchanan (1968), followed by a superior state population growth rate for the next 20 years.

Just as the that study had been rejected in 1971, likewise the government decisions of 1985 to eschew the ERDO study and their 2003 policy to implement Public Service Decentralisation in contradiction of the NSS, collectively, show that there was either denial or little understanding of the benefits flowing from urban agglomeration. The government decision of July 2010, to suspend its Decentralisation strategy and to investigate the outcome of its part-implementation – having achieved just 4,000 transferees out of 10,600 in six years – such policy has proved to have been both costly to the exchequer and arguably, portrays evidence of political short-term expedience. It likewise has been criticised on grounds of creating un-necessary executive and management inefficiencies.

6.1.2 Rural to Urban Demographic Momentum

From Figure 6.1, the move from rural to urban classification is shown to be a slow process over time, with an estimated assimilation of about 6,200 per annum (Williams, Hughes and Redmond, 2010a). Ireland's urban population share in 2006 is 60.71%, having progressed from just over 50% in 1966, as set out in the next table 6.3.

Table 6.3: Ireland's Urban and Rural Population Composition: 1966-2006 (000's):

Year	Urban	%	Rural	%	Total Population (000s)
1966	1,445	50.10	1,439	49.90	2,884
1971	1,585	53.22	1,393	46.78	2,978
1979	1,873	55.61	1,495	44.39	3,368
1986	2,002	56.55	1,538	43.45	3,540
1996	2,108	58.13	1,518	41.87	3,626
2002	2,334	59.59	1,583	40.41	3,917
2006	2,574	60.71	1,666	39.29	4,240

Source: Table, p. 67, APOCC No. 9, *Private Property*, April 2004, Chapter 2, by *Tom Dunne*, DIT, published by Irish Government, Government Publications together with Tables 5B and 5C of Census 2006 – Principal Demographic Results.

Thus the state's urban population share lags the EU average by 8% (Eurostat, 2008). The gradual urbanisation time dynamic of State population is captured in the attached CSO graph which commences with the 1926 census, thus:

Figure 6.1: A Time-Series Change of State Urban to Rural Populations

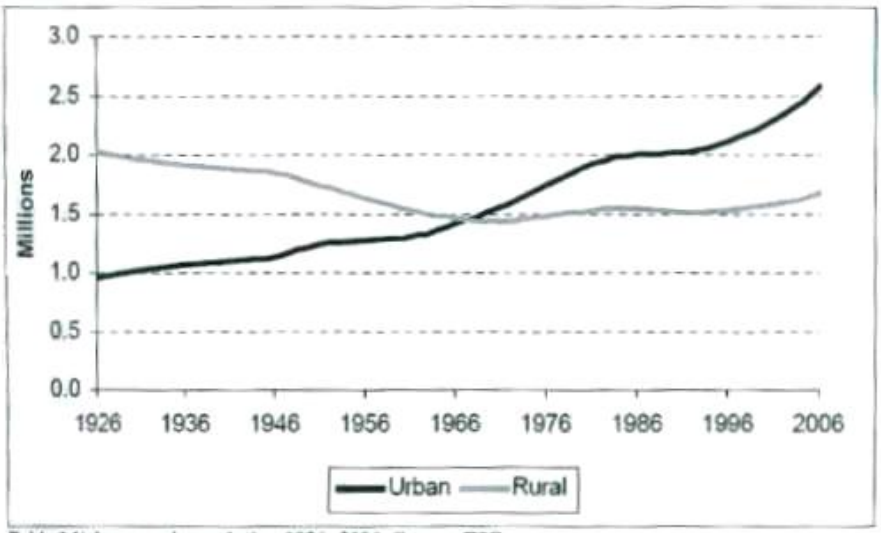


Table 3 Urban rural population 1926 -2006; Source CSO

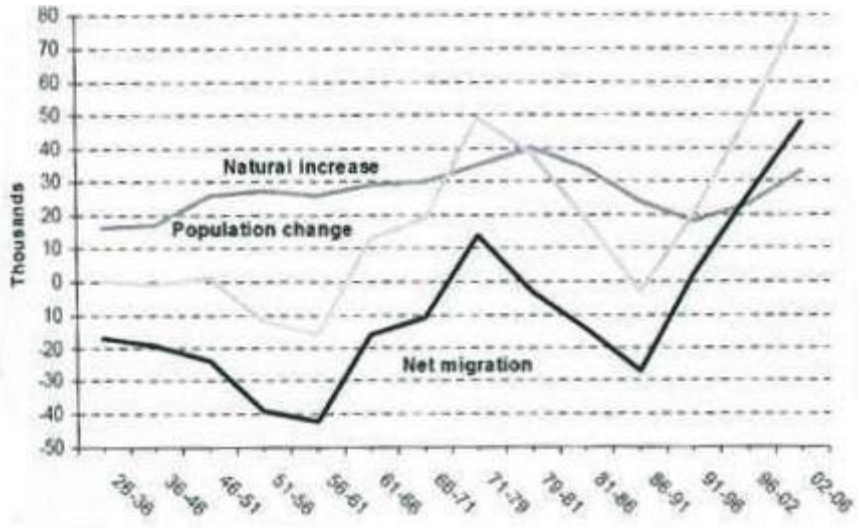
An interesting insight from the above figure is that by 1966, once the urban population surpassed the rural aggregate for the first time since census taking commenced in 1841, the rural population began to stabilise before 1976 and then experiencing its first period of growth, particularly from 1996 onward. The urban and rural population share for the individual planning regions in 2006 shows a rural majority for the West and Border with a small rural minority for the Midlands, South-East and Mid-West, Table 4, Vol. 1, CSO 2006 census. However, should the combined absence of strong net in-migration and city-led

urban agglomeration persist over an extended period of economic downturn, it is difficult to envisage how the upward-tending rural curve in the above graph can be maintained. Thus the RoS area, with an overall rural population majority is unlikely to maintain the 1996-2006 near-parity 19 BP spread population performance with the GDA

6.1.3 Components of Population Growth

As recently as the 1996 census, the predominant Irish trend-direction was for indigenous-based out-migration. Being both offshore and industrially-peripheral, the state has experienced substantial fluctuations in the component of migration which is international in scale and origin. This is shown graphically in the following Figure 6.2, thus:

Figure 6.2: Components of Ireland's Population Change 1926-2006



Source: CSO (2006), Principal Demographic Results

Note: the sharp upward track of the above graph lines has continued post the 2006 census with aggregate total population growth of 220,000 taken from the CSO *Population and Migration Estimates* for 3 years to April 2009. Anecdotal evidence suggests that natural growth is now balanced by net out-migration, estimates for which should be published in October 2010.

In bringing this figure up-to-date by incorporating the CSO *Population and Migration Estimates* to April 2009, a sharp downward trend reversal in the migration graph-line is evident, although the inter-censal population change would still be expected to grow up to the 2011 census due to strong natural growth combined with strong in-migration on the two post-census years. In examining the almost parallel 'shadowing' track of the population-change line, this confirms the historically-dominant influence that

emigration has exerted on the total population performance graph-line. With the exception of one inter-censal period during the 1970s these data confirm that the state's net-migration since the first census following independence of 1926 was outward in direction until the 1990s.

Weak urbanisation was unable to absorb the long-term trend of falling rural employment and consequent depopulation of the inevitable contracting RoS area population. Subsequent development of its services-sector with an ensuing strong demand for labour reversed that trend in 1996-2006, continuing for a short period thereafter. Subject to future economic fluctuation and to government migration policy, world long-term in-migration 'push' pressure are forecast for first-world countries in line with world population growth (Poot *et al,* 2008).

6.1.4 The Policy Issues applied to Dublin and the GDA

With a regional population approaching 1.75 million, the GDA has commenced its emergence as a small city region and a potential embryonic global city of the 21st Century, Taylor (2004a and b, and OECD (2006).

Dublin is not in competition with other Irish settlements. As the capital and primate city in a globalising world its competition *inter alia,* is with other EU capital cities. Under seven relevant data comparisons, NESC (2008) compares Dublin with nine such cities in the following Figure, thus:

Figure 6.3: Dublin Compared with a Selection of European Capital Cities

Metropolitan region	Population (millions)	Share of national population %	Share of national GDP%	GDP per capita ('000 USD in PPPs)	Labour productivity ('000 USD)	Employment rate %	Activity rate %
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Dublin	1.6	39.2	47.6	38.9	79.7	95.9	50.9
Vienna	2.2	27.2	33.7	37.6	82.6	92.4	49.3
Stockholm	2.2	24.6	31.5	36.7	71.7	94.3	54.3
Oslo	1.7	37.0	36.5	35.0	68.5	95.7	53.4
Helsinki	1.8	34.6	42.1	34.0	68.1	93.2	53.5
Copenhagen	2.4	44.4	49.5	33.5	65.3	94.9	54.1
Lisbon	2.7	26.0	37.9	27.1	57.6	92.4	51.0
Prague	2.3	22.5	34.7	25.6	51.4	95.4	52.3
Budapest	2.8	27.6	45.6	23.5	54.3	95.5	45.4
Warsaw	3.0	7.9	16.2	23.1	60.7	88.5	43.0

Source OECD (2006); column 2 NESC Secretariat.

Note: Dublin's is second only to Copenhagen's 44.4 % as a share of national population. In world terms, O'Sullivan (2009:80, Table 4-4), lists Montevideo, Uruguay at 39.36% and Santiago, Chile at 34.87% for countries with a smaller or similar population to Ireland. That O'Sullivan table also lists much larger-populated cities of ten to eighteen-times Dublin's population. However their respective larger countries have an average 18% of population in their largest city. Accordingly, small countries have a propensity to have higher percentages of population to be in their capital or largest cities.

Already, by the mid-1980s Dublin's primacy and function had been confirmed by Bannon (1984) in an update to that doctoral research (1973). The development of urban economic theory and the identification of urban agglomeration (UA), serves to places the GDA in a position of advantage, magnified beyond Dublin's size compared with other Irish settlements because of their absence of agglomeration evidence. However, the specific asset of Dublin and the economic benefits of cities generally have only slowly been appreciated and accepted as an influencer of national growth (*vide* NESC 117, 2008; Thornhill, 2009).

In summary, policy issues continue to be dominated by the suite of plans and guidelines comprising the NSS (2002) and the NDP (2007-2013), the seven RPG for the eight planning regions (2004-2016), (with Dublin and Mid-East combined as the GDA), the County Development Plans (various dates) and Local Area Plans for specific, mainly urban areas. There is no evidence of policy deviation from the general thrust of BRD,

and little or no apparent recognition of urban agglomeration. A polycentric-centripetal focus of densification is central to policy decision making.[33]

Against the thrust of current agglomeration literature, the NSS places reliance on future potential of 'complementary strengths' and to a lesser extent in the concept of 'Linked Gateways and Hubs'. It states:

> *There is evidence of growing interaction between Cork and Limerick and also between Waterford and Cork and between Limerick and Galway. This interaction suggests future possibilities for combining the complementary strengths of these cities and expanding such interaction to achieve a critical mass strong enough to balance the type of critical mass that has been achieved by Dublin (ibid p.41).*

In Section 3, pp, 38-39, on *Future Spatial Structure* the NSS, in setting out its intended policy implementation is non-discriminatory as to settlement size, as applied to both Dublin and elsewhere:

> *By targeting strategic centres with the potential to be drivers of development at national level and within their own regions, and by including county towns, smaller towns, villages and rural areas in this process, a dynamic urban and rural structure can be achieved.*

In summary, this non-recognition and non-discrimination of the specific opportunity for cities to energise regions is reflective of the challenges faced by Irish policy strategists. The advice from McDonald, J. (1997) in reference to *regions without cities* is either unknown or unheeded by policymakers. An instructive interview, conducted with a senior DoEHLG planning strategist in 2010, assisted in clarifying the background to current and prospective public policy. The following bullet-point summary of that significant interview helps to clarify the particular local, political and short-term context within which planning strategists must operate:

- The RPGGDA of Nov. 2004 confirms the removal of the ban on a natural growth-only policy for Dublin, which had existed since the early 1970s.

[33] That is, apart from the ones in the other direction such as Government Decentralisation.

- However the DoEHLG-suggested initiative, the Gateway Innovation Fund strategy was criticised by 'An Bord Snip' and is probably a 'non-runner' - given the current economic constraints.
- Thus, historically, it suited the political corpus that regional planning strategy almost disappeared during the 1980s and 1990s.
- "The DIT 'Twice the Size' focus on maps is too superficial and needs to recognise the wider political context".
- There is appreciation of the role in research being played. The DIT's Planning Staff output – not least in the 'Twice the Size Study' needs to be able to appreciate the political context, cultural background and thus the limitations under which the planning strategists operate.
- Citing a relevant example of the pollution and sustainability problem in the State's 485,000 septic tanks, the official noted that despite the EU having taken Ireland to court, the local political franchise – the Association of County Councils – refuses to accept that there is a problem! Won't debate it "That is the end of that", they say.
- Thus their focus has and inevitably, will continue to opt for green-field development so as to be seen to be delivering local development and employment opportunities; this is politically attractive, ignoring the more contentious issue of over-zoning and its potential for political corruption.
- Queried on the fact that the existing NSS does not emphasise the benefits of urban agglomeration, the official noted that the local thinking is the opposite: that once Broadband and other 'soft' infrastructure is in place it will be possible to promote 'cottage' industry/ service initiatives to all parts of the country. There is no understanding of, let alone recognition of UA.
- Also discussed is the fact that there is little recognition as to the benefit of cities or of the need for a 'minister for cities'. This is in contrast to the government position to retain existing smaller agencies such as Uadaras.
- A city-based regional authority is a 'non-runner' because of the GAA-type allegiance to the 'county unit'. This is deep-rooted and probably non-negotiable.
- Likewise it is uncertain that there is any major-party enthusiasm for elected mayors. Dublin might still happen but not elsewhere, despite the current

'dysfunctionality' of and recommendations made for Limerick's plight, made by a former Dublin City Manage in his report on the city's needs.

In summary, it may take considerable time in years, to bring about any understanding of or acceptance of the benefits of urban agglomeration as one that is likely to be politically appreciated or accepted.

6.1.5 CSO Population Releases, Estimates and Projections

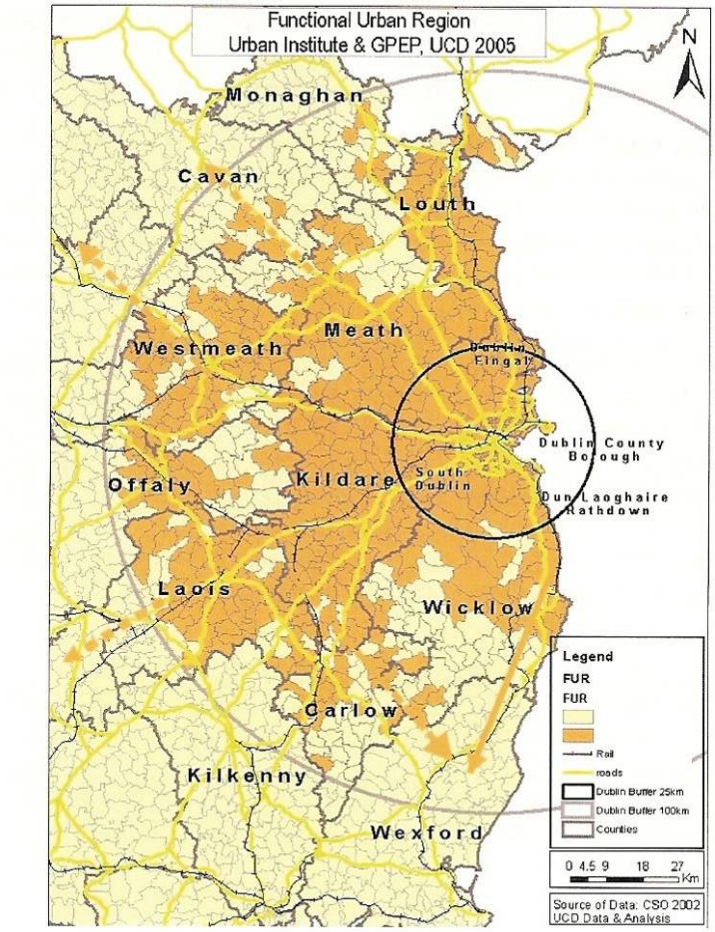
CSO data confirm that the State's Natural Growth has more than doubled over the past decade to 33,789[34], having bottomed-out at only 16,120 in the year to April 1995.

The other significant related factor is that the Death Rate has continued to decline: this is highlighted in Deaths at 32,200 for year to April 1987, having steadily decreasing to 27,000 in the year to April 2006. (Table 9, CSO, 12th September 2006) The decrease in deaths of 16.15% in absolute terms should be viewed in the context of the State's 19.61% population increase in the twenty-year period to April 2006.

From CSO data, a more comprehensive analysis of respective State, GDA, RoS, Mid-East and Dublin population movements confirm a number of significant diverging trends for these specific areas as follows: In aggregate, in the decade since 1996 the RoS net in-migration was 225,452, amounting to 65.31% of aggregate State migration of 345,212. Thus, the RoS area has been the recipient of 6.66 % net in-migration *greater* than its 1996 pro-rata 61.23% population share. Given its slight loss in total 'in-employment' share over that ten-year period, this would be a strong indicator of growth in long-distance commuting from RoS to the GDA and more specifically to Dublin, thereby reinforcing the evidence of its extending SoI along its radiating transportation corridors (*vide* Figure 6.4: Dublin FUR (2005)).

[34] In year to April 2006, since having increased to 45,100 in year to April 2009, CSO Population and Migration estimates.

Figure 6.4: Dublin FUR (2005)



Source: Williams, Sheils and Hughes (2007

The Mid-East's strong in-migration and natural growth outturn when combined with Dublin's solid natural growth has thus impacted with mixed results on the overall GDA performance. In the ten years to April 2006, in aggregate, the GDA natural growth of 137,105 represented 51.05% of State aggregate natural growth compared with 38.77% of 1996 population share. Proportionately, this was 31.67% ahead of its 1996 share of State population. As already stated, when depressed by Dublin's poor in-migration performance, the GDA share of State migration was just 89.48% of its pro-rata population share.

Dublin's population share has diluted from 29.18% to 28.00% over that period. Surprisingly, its natural growth has been quite robust at 34.48% of State share. However, with its share of State in-migration being only 10.52%, the capital city and county region therefore has only obtained 37.58% of its pro-rata share of migration. With its strong

progress and maintenance of its national share of employment it is evident that the capital's population growth has been depressed, to the extent of Dublin's population deflection and likewise to its increased level of job-based commuting, both to the Mid-East and RoS regions (*vide* Vol. 12, 2006 census). This is attributable to the low pro-rata rate of house-building supply within Dublin over this period and as a consequence, the widening in the open market value differential between Dublin and the rest of the State housing and, in a lesser extent, to the Mid-East region. [35]

With 61.23 % of State population in April 1996, the RoS area in 1996-2006 had achieved only 131,444 or 48.95% of State aggregate natural growth, i.e. a 79.94% pro-rata contribution. This contrasted with its aforementioned 65.25% share of total State in-migration over that decade. Accordingly, its natural growth deficiency was almost counterbalanced with a robust in-migration surge. The outcome was a small overall RoS loss of percentage population share, down from 61.23% in 1996 to 60.79% in 2006. The other striking contrast between the GDA and RoS areas is their respective natural growth contributions when represented as a percentage share of population: 131.67% against only 79.94% for the RoS, a ratio of just under 1.65:1.00.

Now that future economic growth prospects have sharply declined, Dublin and Mid-East's higher natural growth propensity, resulting from its lower age profile combined with its UA effect, will likely result in the GDA resuming its long-term trend of increased share of 39.21% of State population in April 2006.[36] This supports the view that sustainable growth with less pressure on infrastructure is a more desirable long-term outcome: one that, on the basis of this analysis, would result in a higher GDA share of future population growth, given its more robust propensity for natural growth.

The overall conclusion in terms of demographic outlook is that, if robust long-term economic growth with a similar demand for foreign labour were to have continued, it is

[35] Interviewed on National Radio (RTE 1) on the publication of the Government's Transportation Strategy on 1st November 2005, Frank McDonald of the *Irish Times* also emphasised the extent to which the Motorway Programme of radial routes out of Dublin has contributed to encouraging long-distance commuting.

[36] For instance, by April 2007 the GDA share of State population had risen to 39.34%, as per CSO Population and Migration Estimate for 2007.

probable that the State's annual level of net in-migration would have remained above that of natural growth. Thus a strong correlation exists between a strong State GDP economic performance and the high RoS population growth 1996-2006. Contrasting this, it is instructive to note the recent concentration of IDA job announcements for Dublin at a time of deep economic recession. This supports NEG theory that there is a strong relationship between population concentration and density with competitiveness and globalisation trends (Fujita and Thisse, 2002).

6.2 Analysis of Issue 2 - Town Size, Urban Hierarchy and Possible Growth Locations

Having assessed the GDA and RoS urban and rural population decomposition as at 1966, 1996 and 2006, together with their respective contributions to population growth for the 1966-1996 'traditional' and 1996-2006 'recent' time periods, this history analysis of growth is extended by an investigation of the contributions that all settlement types have made for each growth period and for both areas of state.

This approach is undertaken to show the extent to which individual types of settlement will each have contributed to 'historic' population growth. The objective from these results is to provide a plausible structure upon which future GDA and RoS area growth scenarios can be formulated, whilst noting that past evidence of growth does not always replicate future growth outcomes. Therefore, attention will be placed on the CSO growth forecasts under the national and regional 'traditional' and 'recent' growth projections.

The first task is to investigate the GDA and RoS area long-term growth for each settlement type, having regard to their 1966 population weighting, population growth and growth-share, thus;

Table 6.4: Analysis of GDA Settlement Contributions to 'Traditional' Growth 1966-1996

	1966 Pop.	1966-1996 Growth	Growth %	Growth Share
Settlement type / weighting %				
Dublin / 74.30	734,967	217,725	29.62%	52.28%
Large Towns / 1.38	13,668	161,061	1,078.38%	38.67%
Medium T. / 2.25	22,230	34,187	153.79%	8.21%
Smaller T. / 1.93	19,138	-425	-2.22%	-0.10%
Smallest T. / 2.52	24,973	-5,125	-20.52%	-1.23%
Rural areas /17.62	174,226	9,046	5.19%	2.17%
Totals / 100.00	989,202	416,469	42.10%	100.00%

Source: Authors analysis of CSO Settlement data, 1966 and 1996 censuses, Vol. 1.

In 1966, Dublin's dominance was overwhelming and Bray was the sole large town in the GDA. By 1996 eight additional settlements had become large towns, which together with the growth of Dublin comprised almost 91% of aggregate growth. Despite this the capital, with a 74.30% population weighting, only accounted for 52.28% of the GDA share of growth. The rural population 'residual' exhibited only modest growth and thus the urban share of increased from 81.00% to 87.50% of the total GDA population.

The first task is completed with a similar analysis of the RoS area, thus:

Table 6.5: Analysis of RoS Settlement Contributions to 'Traditional' Growth 1966-1996

	1966 Pop.	1966-1996 Growth	Growth %	Growth Share
Settlement type / weighting %				
Cities / 11.25	213,207	147,402	69.12%	45.27%
Large T. / 7.31	138,499	157,173	113.48%	48.27%
Medium T. / 5.30	100,454	38,925	38.75%	11.95%
Smaller T. / 3.67	69,605	-13,825	-19.86%	-4.25%
Smallest T / 4.34	82,323	-6,087	-8.75%	-1.87%
Rural areas / 68.13	1,290,712	2,028	0.16%	0.62%
Totals / 100.00	1,894,800	325,616	17.18%	100.00%

Source: Authors analysis of CSO Settlement data, 1966 and 1996 censuses, Vol. 1.

Even to a larger extent than the GDA, during 1966-1996, the RoS population growth was dominated by the contribution of its embryo cities and large towns which together

accounted for 93.54% of total growth. Both categories of small towns regressed whilst the dominant rural areas category was almost stagnant in growth terms.

The individual performance of embryo cities and large towns reflects the categorisation of Galway as a 'town' in 1966. Accordingly the growth of the embryo cities is understated because of Galway's 'promotion' to 'city' classification in the following decade and to this same extent the growth of the large town category is overstated. The failure of the rural areas category to grow reflected the ongoing rationalisation taking place in agriculture. Because of the overwhelming weighting of the rural area population together with its stagnant growth, the RoS area population rate of growth at 17.18% was just 40.81% that of the GDA during 1966-1996.

1996 marked a watershed in Irish demography and thereafter net in-migration, most of which was non-indigenous, became the dominant component of the state's largest demographic growth phase lasting until April 2009. Likewise, the population growth-contributions to settlement categories changed during the 'recent' 1996-2006 period. The analysis for the GDA and the RoS area-component percentage contribution of growth are set out in the next two tables, thus:

Table 6.6: Analysis of GDA Settlement Contributions to 'Recent' Growth 1996-2006

	1996 Pop.	1996-2006 Growth	Growth %	Growth Share
Settlement type / weighting %				
Dublin / 67.79	952,692	93,077	9.77%	36.24%
Large T. / 12.43	174,729	70,249	40.20%	27.35%
Medium T. / 4.01	56,417	33,460	59.31%	13.03%
Smaller T ./ 1.33	18,713	14,719	78.66%	5.73%
Smallest T ./ 1.41	19,848	10,143	51.10%	3.95%
Rural areas / 13.03	183,272	35,217	19.22%	13.70%
Totals / 100.00	1,405,671	256,865	18.27%	100.00%

Source: Author's analysis of CSO Settlement data, 1996 and 2006 censuses, Vol. 1.

During this 'recent' period 1996-2006, Dublin's share of growth at 36.24% lags its 1996 population weighting of 67.79%. In contrast and for the first time, the rural areas population weighting of 13.03% is evenly balanced with its 13.70% growth in population. Most notably, the population weighting of the aggregate towns' categories at

19.18% achieved 50.06% of the entire GDA growth 1996-2006. As is confirmed in the next table, the overall population growth for the RoS area at 16.07% was reasonably similar to that of the GDA's 18.27%.

Should that 'recent' comparative growth-rate for the two areas be maintained in the long-term, then the prospect for a GDA population convergence would be remote in time and the thesis hypothesis would show a strong 'null' result. In completing this 'settlement hierarchy' analysis, a similar examination of the RoS area's population performance over 1996-2006, shows:

Table 6.7: Analysis of RoS Settlement Contributions to 'Recent' Growth 1996-2006

	1996 Pop.	1996-2006 Growth	Growth %	Growth Share
Settlement type / weighting %				
Cities / 16.24	360,609	42,474	11.78%	11.90%
Large T. / 13.32	295,672	75,275	25.45%	21.09%
Medium T. / 6.28	139,379	37,457	26.87%	10.50%
Smaller T. / 2.51	55,780	19,343	34.68%	5.42%
Smallest T. / 3.43	76,236	22,041	28.91%	6.18%
Rural areas / 58.22	1,292,740	160,306	12.40%	44.91%
Totals /100.00	2,220,416	356,896	16.07%	100.00%

Source: Author's analysis of CSO Settlement data, 1996 and 2006 censuses, Vol. 1.

This table shows conclusive evident of a strong positive correlation between settlement-type weighting and share of growth. The two exceptions to this RoS correlation consistency are 'cities' which underperformed and towns which significantly over-performed.

Yet, during this 'recent' period the combined GDA large and medium town categories achieved a more robust share of growth performance than their RoS area counterparts. Furthermore, this was achieved in a tight clustering of large and fast-growing towns in close proximity to Dublin. This was largely due to population deflection from the capital, principally because of housing affordability and supply constraints issues.

6.3 Analysis of Issue 3 - Economic Geography and Spatial Characteristics

As the first world economy continues to expand its services sector growth-share of total employment, the benefits of urban agglomeration became more prominent, particularly for medium and large city categories of the settlement hierarchy. Now that the deepest economic recession for seventy years has occurred with the lingering possibility of deepening into a double-dip still a possibility, for Ireland this threat poses very serious consequences.

To date, the state's contribution to cerebral exports remains steadfast but in doing so contributes to a two-tier economy of growth and stagnation. As already discussed, the economic benefits arising from urban agglomeration, is the subject of widening and deeper research as NEG becomes integrated with economics and geography. With the benefit of advancing economic theory and the deployment of econometrics to increasing data availability, a clearer path to policy implementation that is amenable to a services-dominated advanced economy is now available. However implementation can be frustrated by obstructive political expediency responding to local, short-term requirements.

It could therefore be anticipated that at the local level, there may continue to be a denial of the NEG findings, that policy strategy of spreading employment at the regional level is counterproductive (Morgenroth, 2008). Likewise, there could be a similar resistance to accepting the principle that a region devoid of cities will continue to be at a considerable economic disadvantage (O'Sullivan, 2009, *supra).*

6.3.1 The Prerequisite of Density for NEG-type Growth

What are the spatial characteristics and requirements of NEG models? Much research has been undertaken as to the differences between international and domestic characteristics, particularly relating to manufacturing industry. In this there appears to be greater certitude as to the spatial characteristics of US industry as compared with a fuzzier European picture. However, the gradual economic integration of Europe may serve to reduce that uncertainty.

Zoellick (2009) points to the near-universal trend of centripetal agglomeration promoting the advantages from having larger settlements, especially efficient-sized cities.

From this divergence between plan and reality, it can be seen that the overall trend has been one of greater dispersal than had been envisioned in 1999. Regardless of the morphology of such growth, what is also conclusive is the sustained trend of marginal GDA population growth, one that is somewhat greater than that of RoS, specifically as to the component of natural growth. Should such trend continue, the resultant GDA projected mid-to-late-21st century population of three million-plus, would then be expected to match that of the RoS (*vide* Ch. 5).[37]

6.3.2 Evidence for Centrifugal versus Centripetal Forces

Likewise, the emerging literature points to city-core growth, one that will further enhance the consolidation of the inner city. *The new economy of the inner city* (Hutton, T.A., April 2004), is a significant addition to this growing field of futuristic research.

Consequently, and specific to Irish conditions, in the study of demographic relationships linking population with the economics of end-use demand for the Built Environment, there has been and continues to be considerable debate as to whether towns are adequate substitutes for growth, in the absence of cities. What scale of urbanisation is necessary for the creation and promotion of BRD? What will be the composition of future settlements, as between towns and cities? Specifically, what size of settlement is needed to 'counterbalance' Dublin: especially in the all-Ireland context of the emergent 'Dublin-Belfast economic corridor'? In addressing the hypothesis of this thesis in the timeframe of the 21st century, the following section introduces the research methodologies that are deployed.

In going beyond the base multiplier approach as per Balchin (1995: 31-33), Fujita (2001:31) notes that: *The interaction between economies of scale and endogenous market size can lead to a cumulative process of agglomeration.* That step in the sphere of the new economic geography (NEG) involves analysis utilising bifurcation theory

[37] Colm McCarthy, Consultant Economist and former Economics Lecturer to this author, believes that the GDA morphology already is so spread out that for the most part, public sector transportation is a non-runner, in economic terms. Davy Stockbrokers, *Crawling through the Sprawl: Commuting Patterns, Urban Form and Public Transport in Dublin* (2004). That study concludes *It is time to accept that Dublin, unfortunately, now resembles a US sunbelt city, irreversibly car dependent, and that the sprawl which has already occurred severely limits the potential of rail-based public transport solutions. There is nothing to be said for compounding the errors of land-use policy by proceeding as if they had not happened (op. cit., p. 26).*

(*op.cit*.). Against this entrepreneurial backdrop, econometricians thus describe a 'core' region as having clusters of firms that are soundly based on models of profit, cost returns and capital constraints. A healthy polycentric economy is grounded on inter-regional trading between a core and peripheral region. Endowment and factor-mobility suppositions point to adequacy of returns on capital and labour: ones that generate regional competition and core/ periphery equilibriums. Accordingly, the creation of profit is not just the internal efficiencies of an industrial plant or of a service-sector firm: *it is, additionally, that which is provided by its locational advantage of being in an urban milieu* (Marshall, 1920).

Breathnach, in Bartley and Kitchin, (eds) (2007: 151-153) notes that since the start of the 1990s, Dublin has become the preferred location for FDI software, international financial services, back-office services and producer services activities. He points to the industrial clustering location characteristics as identified by Porter (1990), thriving on adequacy of skilled labour supply, knowledge transfer, research and development, all which tend to be spatially concentrated. Furthermore, Irish firms *remain firmly committed to the long established pattern of keeping all their central administration staff in a single location (and typically in a single building) even though the bulk of the work involved is routinely and relatively easily relocated, especially in the context of modern information technology* (ibid. p. 153).

6.3.3 The effects of Urban Concentration on Economic Growth

Morgenroth (2002) points to the literature of Henderson (2000), *The Effects of Urban Concentration on Economic Growth* in discussing the relationship between economic growth and the extent of urban concentration. He does so by way of measuring the extent of primacy or the share of the largest city region or 'metro area' in the national urban population. This research finds a direct relationship between primacy and per capita GDP. For Ireland, Henderson regards Dublin as one of the cases of 'significant excessive primacy'. However, the particular research and analysis informing this view was undertaken prior to the transportation/ roads investment-boost that has characterised the Celtic Tiger period of robust economic growth. His research findings for cities, confirms a correlation coefficient of 0.85 (in logs) of percentage urbanisation and

economic growth. Against such urban agglomerative advantage, the question of any location potential for secondary centres must be considered.[38]

The emergence from the 'soft' sciences and humanities of spatially-related studies, including that of NEG, combined with 'New Trade' (NT) have added a powerful impetus to our understanding of 'cities' and their growth characteristics. The start point was the market-economy based Krugman (1991) *Increasing Returns and Economic Geography* model together with its 1995 Krugman-Venables derivative. In turn, these advances provide spatial descriptors to both evaluate and to extend modern location theory. In the sphere of Normative Economics, such evaluations deployed existing, established, measures including Pareto *Improvements*, Kaldor's *Improvements Compensation Criterion*, and the Hicks *Criterion Norm* in support of agglomeration. This field of knowledge skill, with the aid of extensive data sets, enables spatial analysis to pose interesting and probing questions: ones that challenge the 'accepted' norms that had been dominated by congestion and diseconomy issues.

Walsh, in Bartley and Kitchin (eds) (2007: 52), whilst not specifically defining UA, articulates Dublin's critical mass in the context of local and regional potential, thus:

> *It has been defined as the size, concentration and characteristics of populations that enable a range of services and facilities to be supported and which, in turn, can attract and support higher levels of economic activity. The transformation that has occurred in Dublin since the early 1990s illustrates the importance of critical mass. Dublin's success has been assisted by its population size and structure, level of education, the availability of educational resources, the mix and clustering of different types of labour pools in niche sectors, transport links to other regions and countries, the informal network of people and expertise that provide the scale of critical mass to support rapid economic progress.*

Due to Dublin's high level of direct connectivity with other major European cities, in 1990-2002 tourism expenditure in Dublin grew at twice the national average; thus that region's share of total tourism revenue also rose significantly, from 22% to 30%

[38] McDonald and McMillan (2007: 571) summarise the underlying growth factors that should influence an economic development strategy as being: Export Demand, Import Substitution, Public and Private Capital, Quality of Labour Force, Technological Change (in new products, production processes and diffusion of new technology), Entrepreneurship, Amenities and Infrastructure and both elements of Agglomeration Economics, i.e. urbanisation and localisation economics.

(*Tourism Policy Review Group,* 2003) (Kelly, 2008 p.172). Montgomery (2007) also cites numerous benchmarks upon which Dublin achieves distinction as a successful city on an international scale.

6.3.4 The Spatial Distribution of Economic Activity

The fundamental question in economic geography is how to explain the riddle of uneven spatial development (Garretsen and Martin, 2010). Likewise, in relation to the New Economic Geography they describe how *it is the flow of people, firms and goods between locations that determines the spatial distribution of economic activity in these models, and the distribution (agglomeration or dispersal) of economic activity between locations in turn shapes these flows.*

The same issue in the form of a question was raised some seventy years ago by Losch (1939) in the development of location theory based on economic activity. He recognised the need to have regard to the time dynamic of history and to tie it in with the geography of space and distance in the understanding of the economic process, simply because as he observed: it is not possible to undertake all development at the same time. History is also involved because the spatial agglomeration of economic activity, i.e., in cities, requires decades to develop. Already discussed in the literature review and the accompanying empirical evidence confirms that regions without cities lack the essential agglomeration base and the resultant economic 'virtuous circle' to be able to act as and provide the necessary engine for growth. A region without cities is overly self-sufficient and thus lacks the necessary specialisation of APS-type employment in an advanced and services-based economy .Such regions are deemed to be overly dependent on 'backyard production', as confirmed in O'Sullivan (2009: 17)

It is concluded that this is the missing, vital link, in the case of the missing 'second tier' of Ireland's settlement hierarchy. It raises the question as to in the current government approach to balanced regional development (BRD) in the implementation of Ireland's National Spatial Strategy. Specifically, that question as posed: is the scale size of Ireland's urban hierarchy too small to assume economic efficiency for a successful implementation of BRD? So what might be an alternative policy option?

6.4 Analysis of Issue 4 - Public Policy - Past and Present

This section considers the following subjects:

6.4.1 Employment and Public Policy

O'Sullivan (2009: 50) points to the fact that: *the key notion of sharing a labour-pool is that the boom-bust process occurs at the level of the firm, not the industry.* Accordingly, in developing a formal model of labour pooling, that author demonstrates the advantage for firms in the same industry to cluster. The spatial disadvantage for the isolated firm is clarified together with the key differences applying to cluster circumstance. In applying the urban economic axiom: that price tends to adjust to generate location equilibrium, this results in higher levels of profit, thereby improving the chances of firm survival at a time of economic downturn.

Likewise, because of scale economics in production, O'Sullivan (*ibid*) demonstrates that with agglomeration economics of larger settlements, labour matching associated with worker-skills is also a key component for growth. With agglomeration economics more workers implies better skill matches, likewise confirmed in Skehan (2007). The final agglomeration economy advantage arising for sympathetic spatial public policy implementation: concentration on city-growth is due to knowledge spill over which promotes firm clustering.

Research from Canada by Mum and Hutchinson (1995), as detailed in O'Sullivan (2009) indicates that localisation economics are more powerful in the office sector than in the manufacturing sector. Accordingly, the GDA with more than half of the state's office workers, proportionately benefits more so than elsewhere in Ireland (Morgenroth, 2008). This literature confirms that for regional policy, the public policy imperative of spreading employment, whilst politically expedient, *will be counterproductive in a globalised world economy where firms are free to seek the most profitable location for their activities at a global level. Thus while such a policy might reduce regional*

disparities, it is also likely to result in overall lower welfare. Section 6.5 will focus on future public policy for Ireland. Morgenroth's (*ibid*) findings appear to weaken the NSS case for polycentricity and Hall and Pain (2006: 193-194) also point to this strategy contradiction.

6.4.2 Disaggregation and Differences of Two Periods of Growth -Compared

For contextual background purposes the final demographic historical examination comprise both disaggregation and component analyses for 1966-1996 and also a comparison with the most recent 1996-2006 data. This is done for three reasons.

- First, the census of 1996 marks the commencement of significant non-indigenous in-migration to Ireland.
- In the following decade the most sustained period of state population growth occurred and has continued for the following three years to April 2009, as highlighted as the second 'step' of growth in Figure 1.1.
- Finally it is noted that - unprecedented since the first census of Ireland (1841) - by April 2009 the GDA growth has begun to weaken relative to the growth of the RoS area. Should this 'recent' trend development as distinct from the long-term 1966-1996 'traditional' period of growth be maintained, the thesis hypothesis would be nullified.

At the census of 1996, the non-native born component comprised some 7.0% or 254,000 of state population. However, ten years later some 14.6% or 460,000 of total population is so classified, *vide* CSO (2006) Principal Demographic Results. From 1996-2006, due principally to the increasing demand for labour – particularly for the construction and healthcare sectors of employment – significant non-indigenous in-migration continued on for a further two years to April 2008.

6.4.3 Analysis of 1966-1996 Period

This 'historic-analysis' commences with a summary of the two components natural growth and out-migration for the period 1966-1996 together with their respective percentage contributions to population growth, thus:

Table 6.8: Components of Population Growth 1966-1996: 'Traditional' Period

	Natural Growth	Share	Migration	Share
GDA	426,405	47.92%	-9,783	-6.62%
RoS	463,448	52.08%	-137,985	-93.38%
State	889,853	100.00%	-147,768	100.00%

Source: Analysis by Thesis Author based on CSO Components of Population Change

Despite the GDA having just 34.30% share of state population in 1966, over the next thirty years its share in natural growth was almost 48% because of a lower age profile with fewer deaths proportionate to its population. Dublin and the GDA obtained an increasing share in the state employment growth and its out-migration share was just one-sixteenth of state emigration. Accordingly, the GDA share of state population rose to 38.77% by 1996. Table 2.5 confirms that over this 30 years to 1996, the State's population grew by almost three-quarters of a million in the 'first step' of growth (*vide* Fig. 1.1). Thus the GDA had grown at some 2.45-times the rate of the RoS area over that period. In doing so it had accounted for 56.12% of total State population growth during 1966-1996.

The respective 1966 and 1996 populations, population growth for the period, percentage growth and percentage compound annual growth rates for the two areas of state are now compared in the next table 2.6. The end-objective is to assess and compare the 'spread' in the difference between the GDA and the RoS area's population growth. This analysis culminates in the finding of a 65 basis-points (BP) spread, next shown in Table 6.9 This becomes one of the data results that are then applied to this research's HYMOC model in the next chapter so as to assess prospective convergence time outcome, measured in years.

Table 6.9: GDA and RoS Population Performance (1966-1996) – 'Traditional' Period

	1966 Population	1996 Population	30-year Growth In Population	% Growth	% per annum Compound
GDA	989,202	1,405,671	416,469	42.10	1.18
RoS	1,894,800	2,220,416	325,616	17.18	0.53
State population	**2,884,002**	**3,626,087**	**742,085**	**25.73**	
GDA/RoS Basis Points spread: = 65					

Source: Author's analysis of CSO Population Data for 1966 and 1996 censuses.

Applying the same methodology as above to the most recent intercensal decade 1996-2006, the next table it is instructive to note the much more even growth performance as between the two areas of state, thus:

Table 6.10: GDA and RoS Population Performance 1996-2006: 'Recent' Period

	1996 Population	2006 Population	1996-2006 Growth In Population	% Growth	Growth per annum Compound
GDA	1,405,671	1,662,482	256,811	18.27	1.69%
RoS	2,220,416	2,577,366	356,950	16.08	1.50%
State Population	**3,626,087**	**4,239,848**	**613,761**	**16.93**	
GDA/ROS Basis Points spread: = 19					

Source: Author's analysis of CSO Population Data for 1996 and 2006 Censuses

Given the significant changes that have occurred in 1996-2006 when compared with the previous thirty years, the much closer basis points spread, if maintained, would mean that a GDA convergence would become a remote possibility and would result in a 'null' thesis hypothesis. Accordingly, it is important to set out the components of population growth for this decade, thus:

Table 6.11: Components of Population Growth 1996-2006: 'Recent' Period

	Natural Growth	Share	Migration	Share
GDA	137,105	51.05%	119,760	34.69%
RoS	131,444	48.95%	225,452	65.31%
State	268,549	100.00%	345,212	100.00%

Source: Analysis by Thesis Author based on CSO Components of Population Change

In the ten years to 2006 as shown above, although the GDA population growth was an impressive 1.69% per annum compound, the RoS area still grew at 1.50% per annum compound. The GDA superior Natural Growth performance effectively, was nearly counter-balanced by the RoS majority share of State net in-migration due to their respective population weightings. To conclude this section it is instructive to compare in side-by-side format, the percentage share contributions that migration and natural growth made to the GDA and RoS area over the two periods of growth, as follows.

Table 6.12: Share of Population % Growth – Comparing 'Recent' with 'Traditional' Periods or Migration and Natural Growth Percentage Contributions to GDA and RoS

'Recent'	Mig. %	N.G.%	State %	Traditional'%	Mig. %	N.G.%	State %
GDA	19.51	22.34	41.85	GDA	-1.32	57.46	56.14
RoS	36.73	21.42	58.15	RoS	-18.59	62.45	43.86
State	56.24	43.76	100.00	State	-19.91	119.91	100.00

Source: Author's analysis of Tables 6.10 and 6.11

These data of percentage growth contributions displayed on this table, is used as empirical evidence to support this research's contention that after 2006, the population growth/ contraction is reverting rapidly to the 'Traditional' pattern of differential performance and that it will **not** continue the Basis Points growth pattern as between the GDA and RoS area, as occurred during the post-1996 'Recent' period.

The following points are pertinent to strengthen this contention and also to providing a better understanding is obtained, in the underlying population data of the preceding Tables 6.9 to 6.12 inclusive. The GDA 'core' area experienced a steadier population movement and growth share performance over both time periods, 'recent' and 'traditional'. Significantly, it suffered just a 6.63% share of total state net out-migration, the RoS area having been responsible for 93.37% of that component loss during 1966-1996. The underlying reason for this is that city regions act as sponges that are able to protect potential migration losses due to wide ranges of employment opportunities (Fujita, 1989).

Over the 'recent' period the state's population growth of 613,761 is shown as 100.00%. Of this, in-migration contributed 56.24% and natural growth 43.76%. The sub-division of the migration component attributed the RoS area with 36.73% and the GDA in-migration was the smallest with a contribution of 19.91%. The natural growth comprised a GDA share of 22.34% and the RoS contribution was 21.42%.

The unrestrained employment opportunities, particularly in the house-building sector coupled with government policy for migration dispersal provide the background for the RoS area in-migration. This was, by far, the largest of the four growth components to state population. This was in contrast with a more muted GDA level of in-migration. On

the performance of natural growth it is instructive to consider that at the commencement of the 'recent' period in 1996, the GDA share of state population was 38.77% and yet it had a higher natural growth overall share.

Comparing the immediate past with the short-term prospective economic circumstance, first the RoS area construction employment potential is likely to be constrained for many years, given its housing over-supply which is nearly double that of the GDA, (Williams, Hughes and Redmond, 2010a). Likewise, a tighter cost-benefit regime will focus prospective capital projects to the GDA as evidenced in the July 2010 government announcement. The RoS area economy's future dependence on other traditional economic sectors including Agriculture, Manufacturing, Tourism and Public Services are likely to be similarly constrained. In summary, the economic conditions that were supportive to the RoS area's disproportionate population growth up to 2008, no longer prevail.

In completing this area of the thesis research it is instructive to see how quickly that component has changed since the in-migration high point of 71,800 in year to April 2006. Examination of the annual CSO *Population and Migration Estimates* for the following years confirms net in-migration, year to:

April 2007	April 2008	April 2009
67,300	38,500	-7,800

The anticipated out-migration for year to April 2010 is set to accelerate to -70,000 and for the year to April 2011 to -50,000 as per ESRI (2010). Should this occur, then from year 2006 to 2010 the migration 'swing' would exceed 140,000.

The next section summarises the developing literature that underlines the current policy direction.

6.4.4 The Policy Issues applied to Dublin and the GDA

The articulation of NSS policy at regional level for the GDA is set out in the Regional Planning Guidelines for the Greater Dublin Area (RPGGDA) of July 2004. Its key issues and goals commences with a statement to that effect. Then it sets out a vision statement for

physical, economic, social and cultural dimensions, including the development of a compact polycentric settlement strategy. Other key issues are policies to strengthen the international economic competitiveness of the GDA, to do so in a way that meets the requirements of European Directives, to provide sustainable infrastructure corridors and to strengthen global linkages. The RPGs for all the regions are reviewed every six years and the first review, now underway, is informed by the Regional Planning Guidelines Review document issued by the DoEHLG. It sets out revised population growth targets for 2010, 2016 and 2022, thus:

Table 6.13(a): RPGGDA Population Projections 2010-2022:

	2010 Population as per RPGGDA	2022 Population	2010-2022 Growth In Population	% Growth	Growth per annum Compound
GDA	1,796,900	2,103,900	307,000	17.08	1.32%
RoS	2,788,000	3,271,300	483,300	17.34	1.34%
				Basis Points spread:	**= -2**

Source: Regional Planning Guidelines Review, October 2009, Table 1, DoEHLG

Here there appears to be no recognition of any GDA urban agglomeration effect translating into a population advantage. Instead, this DoEHLG's population policy projection of a 2 BP spread in favour of the RoS area for the next twelve years implies a slightly higher growth path for the RoS area. Therefore, this first direct demonstration of additional HYMOC methodology applications is decisively negative. If this projection were to occur, it would result in a mild divergence and thus would produce an even stronger trend-reversal from the 'traditional' 65 BP spread of Table 6.9 to the 'recent' 19 BP spread of Table 6.10 above. On that DoEHLG basis, the outcome to the pivotal research question of this thesis would result in an affirmative 'null' hypothesis.

In the light of discussions with DoEHLG officials it is tempting to speculate if this Guideline Review 'position' and its demographic outcome as analysed in Table 6.13(a), is representative of the views of that Department's senior planning strategists? On the other hand, does it represent an overbearing 'political' viewpoint? From such discussions, this research was unable to form a definitive conclusion although intuitively, the bias would tend to favour a political upper-hand. In support of this, that Department of government would have participated in the CSO Expert Group's formulation of their central M2F1

Regional Growth scenario to 2026 which is based on the 'traditional' population growth as being the most likely outcome.

It is therefore instructive to use this CSO Regional Population Projections (2011-2026) whilst again starting with the same 2010 base as the next demonstration in deployment of author's HYMOC model. In so doing, it is also instructive to note the last sentence of the first-page commentary from this release, which states: *The analysis in the following pages concentrates mainly on the M2F1 Traditional variant which combines continuing through declining international migration with constant fertility and a return to the traditional pattern of internal migration by 2016.*

Table 6.13 (b): CSO Regional Population Projections 2010-2026:

	2010 Population as per RPGGDA *	2026 Population	2010-2026 Growth In Population	% Growth	Growth per annum Compound
GDA	1,796,900	2,413,000	616,100	34.29	1.86%
RoS	2,788,000	3,283,000	495,000	17.75	1.03%
				Basis Points spread:	**= 83**

Source: CSO) Regional Population Projections (RPP), December 2008, Table 1, DoEHLG
Using RPGGDA Guideline Review figures from DoEHLG pending release of CSO 2010 *Population and Migration Estimates*.

Deploying the above 2010 start date with an 85 BP spread, representing the gap outcome between Tables 6.13 (a) and 6.13 (b), the HYMOC model confirms that the GDA and RoS populations would converge after 53.5 years on the common logs basis and after 52.6 years on the natural logs basis. On a continuous time basis using these parameters, this event occurs towards the end of 2058 which is marginally outside the hypothesis time frame. It can be argued that it is more appropriate to consider the CSO M2F1 projection to the 2021 census for BP spread as shown in the next table, given that 2021 is only one year prior to the DoEHLG RPG review date of 2022.

Table 6.14: CSO Regional Population Projections 2010-2021:

	2010 Population as per RPGGDA *	2021 Population	2010-2021 Growth In Population	% Growth	Growth per annum Compound
GDA	1,796,900	2,263,000	466,100	25.94	2.12%
RoS	2,788,000	3,188,000	400,000	14.35	1.23%
				Basis Points spread:	**= 72**

Source: CSO Regional Population Projections (RPP), December 2008, Table 1, DoEHLG
Using the RPGGDA *Guideline Review* figures from DoEHLG pending release of CSO 2010 *Population and Migration* Estimates

The explanation for the BP spread reduction from 83 to 72 as between Tables 6.14 and 6.15, is that the Expert Group accepted the CSO recommendation, wherein the CSO had applied a smoothing exercise out to 2016 for inter-regional migration flows. This finessing produces a magnification of growth after that date, in moving from 'recent' to 'traditional' patterns (*vide* p. 11 of CSO, 2008).

Given the fact that this CSO Regional Population Projection release was published some ten months before the issuing of the DoEHLG Guideline Review and that the Department always had a senior representative on the CSO Expert Group, provides *a priori* evidence that they adopted a political 'view' despite having foreknowledge of the CSO's above-stated concentration mainly on the M1F2 Traditional variant. This research finds no plausible alternative explanation for applying the DoEHLG figures and in so doing, making the decision to eschew the urban agglomeration long-term population growth potential that is incorporated into the CSO projections for the GDA. This significant finding is further discussed.

What is not a matter of speculation is that the DoEHLG Regional Guideline Review (RGR (2009) was a policy decision by government to use its departmental population growth scenario for all seven RPG reviews, and likewise in so doing, to ignore the 'traditional' CSO variant. This was confirmed by the consultant's clarifying the two sets of instructions issued, to apply the DoEHLG (RGR) population projection to the work of Williams, Hughes and Redmond (2010) (a) and (b) as the basis for future population growth in their

respective background housing consultancy inputs into both the *GDA* and *Border RPG Housing Demand* estimates.[39]

A further demonstration of an application of the HYMOC model's deployment occurs in the concluding part of the second Case Study on Cork, *vide* Appendix 7, in combination with the application of Zipf's Law, where instead of assuming a differential growth rate in Corks favour and assessing how long it would take for its population to reach a particular scenario target; i.e. to reach one-third the population of Dublin on the basis of Cork's population growth having a 100 BP spread advantage. In addition to the Cork Study detailed in Appendix 8 – as per the *Twice the Size* (2008) study, the HYMOC model was used to establish that it would take inordinate time periods and unrealistic levels of growth for the Gateways to reach a size where they can 'challenge' Dublin's supremacy, thereby calling into question the NSS population targets for Gateway and Hub settlements.

In order to assist an understanding of the differential demographic growth process, a parallel case study was undertaken comparing Dublin with Cork. It has been influenced by the deliberations and considerations of the Government's 2007 Expert Group on Population and Labour Force projections, 2041 and by that group's 2008 consideration of Regional Population distribution to 2026. Accordingly, the following commentary represents the view of this research. Extended beyond that date they do not necessarily or otherwise reflect the views of the CSO Expert Group.

Although specific Dublin or Cork vital statistics have not been compiled over the 1996-2006 intercensal periods, by way of using GDA and RoS data as proxy for each settlement, this should act as a guideline for their respective natural growth (NG) futures. For that period, RoS NG was substantially lower than the GDA which enjoyed a favourable average 'gap' of 2.5%, adduced from the data of Table 4.7. However, *because* of the RoS area's gradual NG improvement during that period, a view might be taken in Cork's favour, whereby the longer time-frame implicit in this analysis projection from 2006 on past NG differentials, may subsequently disappear.

[39] Needless to say, both clients were made aware of the CSO Regional Population projections.

Thus NG is taken as 0.8% per annum compound for both cities, allowing for Ireland's expectations of lower mortality and greater life expectancy, combined, per the CSO Expert Group deliberations (2007). It might be argued that in making such an assumption, Cork is being placed in somewhat more favourable light than is now the case. However, it is pointed out that a conclusive picture does require a Cork comparison with Dublin's natural growth projections as against the 'proxy' RoS versus GDA measures used herein, as per the NG analysis, conducted in section 4.3.

The next requirement is to select respective percentage growth exponentials, based on future net in-migration 'expectations' for each area. For this purpose, an even more extreme position is bestowed in favour of Cork. Dublin is assumed to obtain only 0.2% per annum net in-migration for the entire period whereas Cork is presumed to grow by 1.2% per annum compound. Accordingly, the combined effect of the two population growth components NG + net in-migration is that Cork's population is assumed to grow by 2% per annum for that period of time, compared with only 1% per annum compound for Dublin: in other words, an assumed 100 BP in Cork's favour.

Outcome: Applying these variables of growth to author's HYMOC indicator, either empirically or by way of examining the matrix itself, it is apparent that a time-frame of almost 100 years is required so that contiguous Cork's population becomes *half* that of built-up Dublin, thereby conforming with the principles of Zipf's Law. Further finessing confirms that the actual time scale, annually in arrears is 98.5 years or just over 97 years based on a *continuous* exponential growth basis.

Conclusions: Given the fact that the other embryo cities are so much smaller than Cork, it is evident that the NSS strategy for BRD based on Gateway and Hub settlements, alone, will not produce noticeable short or medium-term changes in the respective proportionality for populations of other Irish cities. Even when a long-term perspective is envisaged, the implicit timeframes are substantial and remote to present day. Furthermore, the assumptions made herein as to migration differentials are 'far fetched', especially having regard to Dublin's long-term ability to create net employment growth. Instead of reducing absolute population differences between the cities their respective populations will invariably continue to diverge. In 2006, Dublin is some 843,000 larger in population than Cork. This population *size-difference* on the basis as discussed above

would widen to 1,386,000, or by 543,000 more than at present, at the end of that 98.5 year period, in 2104.

Perhaps, therefore, in the case of this State, any time-ambitions to narrow the population gap between contiguous city 'unit' differentials need to be more realistic. For example the HYMOC model also indicates that in applying similar (favourable to Cork) BP assumptions to above, if a 58 year time-frame is deployed, Cork's contiguous population would reach just one-third of that of built-up Dublin: still substantially less than the Zipf Law indicator of 50%: i.e. assuming over that time-frame that Cork continues to command 'second' position of the Republic's settlements.

It might be argued that in this field of analysis, as an alternative one-to-one comparison, that the respective FUR regions rather than just the limited built-up, contiguous city population might be used as the appropriate criteria, as suggested in conversations with a senior official of DoEHLG. That argument is quickly refuted, however, with the outcomes of their respective **town analysis**, as per the findings of the Cork Case Study. It is evident that the comparative hinterland growth is, and has been, so much more robust in favour of the GDA. Furthermore to-date, there is only limited evidence, for the most recent two inter-censal periods to 2006, that suggests a tentative commencement of Cork's UA process, starting post-1996. Again the decisive advantage of the established UA, in Dublin's favour, makes the above exercise useful, albeit it would appear, solely from an academic standpoint. The detailed analysis for the Cork case study is contained in Appendix 8.

6.5 Analysis of Issue 5 – Future Public Policy

The direction of future public policy relating to the GDA in its population-size relationship to the RoS area is shown to be politically sensitive. The pivotal research question of this thesis as to the prospects for a convergence between the two areas has produced a substantial variation of an 85 BP spread as between the DoEHLG and CSO interpretation of the BP differential for their regional population projections, to 2022 and 2026 respectively. Both state bodies can not be right in their interpretations of this core issue as to which population growth path will prevail. However, an initial glimpse of which direction under recession conditions will be confirmed by census outcome of 2011.

This will provide the first indications of the population differential growth or decline, on the 'core' and 'periphery' regions and the demographic impact that this current severe economic recession is exerting. Will it result in maintaining since 1996 the 'recent' growth variant or will the depressed economic conditions see the re-emergence of the 'traditional' growth differential? In the scenario of out-migration, will there be a marked divergence between the areas? Likewise, how might this impact on the natural growth component? In addressing these questions, two considerations will be kept in mind. First, that the 2011 census will reveal just a short-term picture. For example, the GDA may show earlier signs of economic recovery but, as population is a lag effect there may be little census evidence of trend direction. Second, the thesis hypothesis is not concerned with growth *per se*. Instead, the core issue is that of long-term population *growth differential* expressed in the Basis Points (BP) for the thesis HYMOC application to the two areas.

Examination of the RPGGDA (2004) has found that since the publication of the original Strategic Planning Guidelines (1999), market forces have resulted in a much more robust population growth in the 'Hinterland' area of the GDA together with a substantially weaker outcome for its 'Metropolitan' area including Dublin city. That trend, against what is planned, appears to have continued, *vide* Regional Planning Guidelines Review (2009). Thus market forces over a time of hectic development activity up to 2007, has prevailed over the intended, planned outcome direction. By the 2011 census, the planned Metropolitan population is intended to be 1.25 million with 0.50 million within the Hinterland area. Yet, the Hinterland population growth rate since the issue of that SPGGDA (1999) Guideline, has been at twice the planned level.

The strategic goals and objectives of the current RPGGDA regional plan provides for what appears to be a contradictory settlement policy. Described as a 'compact dispersed model' within the city-region, the pattern of its settlements should be dispersed so as to enhance convenience of access to services from the countryside. In being consistent with the NSS, the RPGGDA stresses that such a typology will ensure that this dispersal objective will be pursued. The political intension is clear: towns are primarily to facilitate the countryside. Although Dublin and its suburban CBDs remain firmly monocentric (Hall and Pain, 2006), the implicit political thrust is for decentralisation. Given the multiple evidence of a faster growth rate being experienced in the Hinterland area –

shaded green in Figure 6.6 – being considerably faster than was intended, the strategic objectives of the compact dispersal model appears to be flawed, in contributing to this outcome. In turn, such evidence appears to weaken the case for maintaining a polycentric policy with its unfolding dispersed residential morphology, whilst at the same time for APS-type job distribution, has been demonstrated in Hall and Pain (2006) for the most part, as not having occurred outside Dublin.

Figure 6.5: Distribution of multi-location APS firms

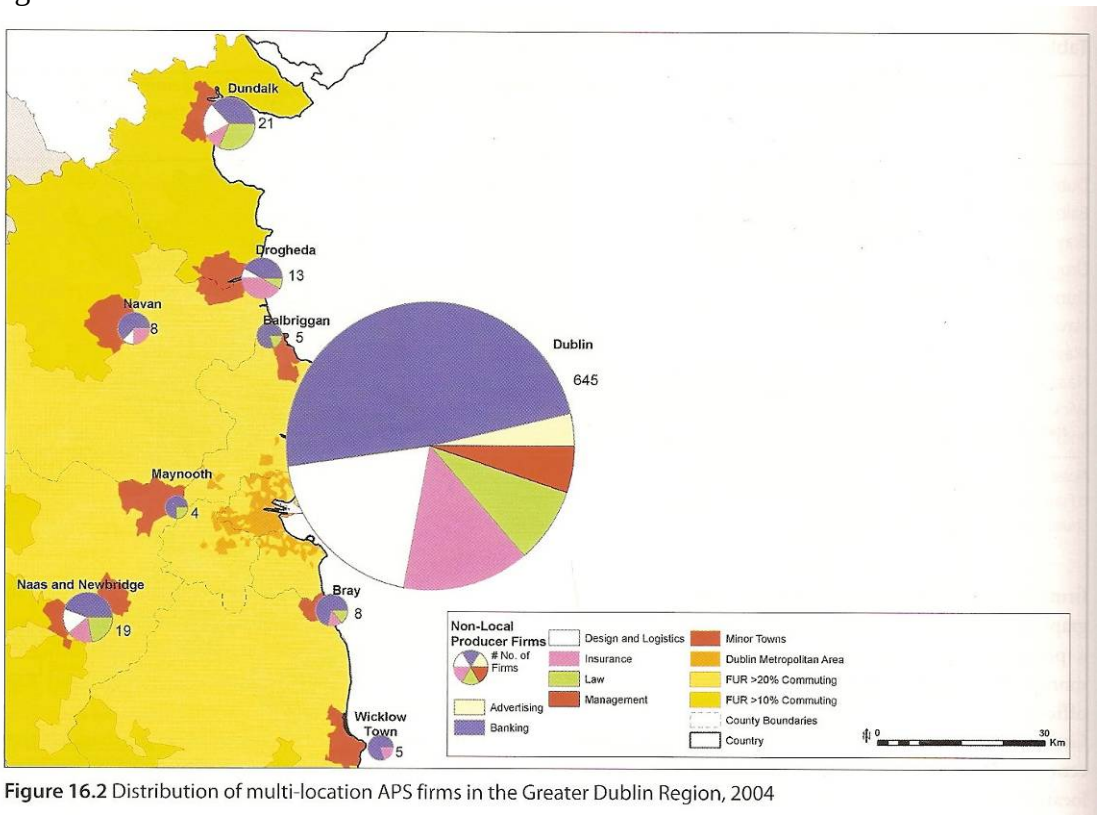


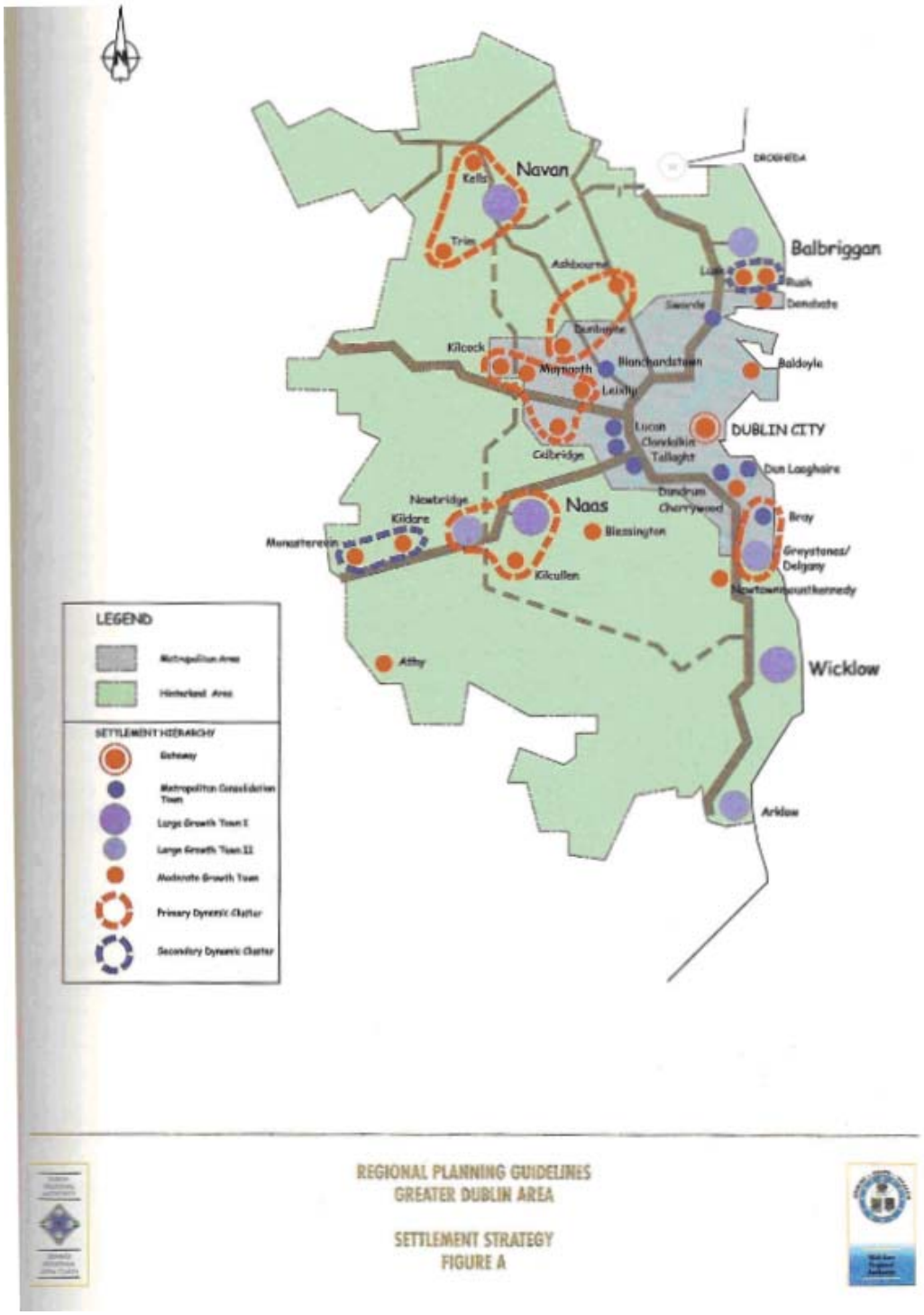
Figure 16.2 Distribution of multi-location APS firms in the Greater Dublin Region, 2004

Dundalk as the next most concentrated APS settlement has 21 locations, representing a 2.88% share and the range for the other large towns is down as low as five. Drogheda, the state's largest town has 13.

Likewise, if Ireland is striving to be a 'knowledge economy' the current thrust of its spatial strategy is at odds with the urban economic and NEG literature. Understandably, this accounts for that strategy's silence on the attributes of urban agglomeration or its implicit spatial centripetal thrust.

In recognition of the polycentric policy emphasis of the RPGGDA (2004: 72) most of the population growth for the Metropolitan area – shown blue, is intended to take place in its 'Metropolitan Consolidation Towns', *vide* the plan's Settlement Strategy Figure 'A', herein displayed as Figure 6.6.

Figure 6.6: The RPGGDA Settlement Strategy



If Dublin is to develop as a centripetally-driven city, with greater density, enhanced agglomeration-driven, with increased sustainability and performing as a more competitive entity, then the political influence on its future direction will be obliged to consider issues such as:

- Political support for an evolving urban/rural population makeup. In the long-term, this should enhance the introduction of urban-friendly policies which in turn will enhance urban growth, to include support for cities and large settlements. This will require articulation to policymakers of the complementary economic advantages associated with urban agglomeration and its rural spill-over potential
- The current political support in the two major parties is rural-centric and is not yet city-focused. This is forecasted to change within ten years, *Twice the Size* (2008) as the country gradually urbanises
- Future general election outcomes may start this policy-focus change, (*ibid*)
- Governance issues and the rate of change – the pressing needs for reform of the governance of Limerick city together with the proposed Elected Mayor for Dublin may strengthen the case as set out in the July 2010 mooted local authority rationalisation. This is a 'first step' imperative if a city region-based system of governance is to replace the traditional one of competing county councils.
- The issue of county or regional governance units. Medium-term economic circumstances facing the country suggest that it is unlikely to be able to afford both county councils and city-based regions. This may thwart the gradual recognition and acceptance of the benefits of promoting urban agglomeration
- Policy formulation and its direction – economic constraints will prioritise both due to funding limitations for future policy implementation and capital spend
- Future capital budgets increasingly, will be cost/benefit tested and projects will be prioritised based on economies-of-scale criteria – which will focus spatially the allocations for infrastructure in densely populated areas
- Housing oversupply – future house building will become more aligned with demand, having regard to over-supply and headship absorption trends

- The current oversupply of housing, will greatly constrain the contribution that house-building has made in recent years as a significant source of potential employment particularly in the RoS area.
- A prolonged world recovery will impact negatively on tourism spend.
- The employment potential for agriculture is associated with continuing rationalisation, as highlighted in recent CSO QNHS releases.
- Both public and private sector employment prospects will be dominated by continuing rationalisations.

To conclude this chapter: it has addressed a series of spatially-focused issues that are related to the central research question of the thesis. *Can the GDA Greater Dublin Area) long-term differential population growth to that of the RoS Rest of State) area result in a 50% convergence of their respective populations and if so, when might this occur?* Many of these issues are inter-relating and are central to demographic, urban economic and in particular, to the new economic geography disciplines.

The research findings on demographic trends and on possible spatial outcomes will be of interest to the policy community, particularly in the light of Ireland's prospective medium-term economic future. In focusing on these issues, this research has identified serious inconsistencies and contradictions in policy implementation. Critically, this has concluded that there is a lack of understanding or an unwillingness to embrace urban agglomeration and to use it to develop an urban hierarchy with critical mass that can drive and prosper a small open economy.

The penultimate chapter will now address the body of work by way of synthesising the overall thesis research findings, thereby leading to the conclusions, recommendations and pointers for further research in the final chapter.

CHAPTER 7: SYNTHESIS

7.1 Synthesis Methodological Approach

Focusing on the hypothesis and the pivotal research question, the approach adopted for this chapter is to summarise from each preceding chapter the conclusions relating to each of the five key issues. The latter part of this chapter is centred on the pivotal research question being defended by the cumulative findings from each of these identified synthesised issues. The methodology utilised a thirty-cell matrix comprised of the five key issues by six preceding chapters 2-6 inclusive of the most significant content, analysis and findings as the basis upon which to build a sequenced synthesis in defence of the thesis hypothesis. This approach reduces the risk of overlooking significant chapter findings whilst it assists synthesising the analysis findings from the preceding chapters, with a particular focus on the pivotal research question of the thesis.

7.2 Issue 1 – Synthesising the imperatives of scale in achieving competitiveness in the context of globalisation

Dublin's population scale is unmatched in Ireland and since census-taking commenced, the GDA growth and scale-size has resulted in an ever-increasing share of state population. Compared with an OECD selection of other western European capitals as shown in Figure 6.3, the GDA has the lowest population although it lies second to Copenhagen in share of state population. Its excessive primacy is due to the state's low population. In part, this reflects in an absence of a 'second tier' in the urban hierarchy and rank-size of cities.

Both urban economic and NEG theory, based on empirical findings, confirm the need for scale size and gravity-mass so as to enhance innovation commensurate with the knowledge economy (Zoellick, 2009). Likewise is the requirement for concentrated populations so as to achieve a spill-over effect on innovation, to promote proximity and density, labour clustering and pooling; the essential attributes of centripetal agglomeration. Such research and its theory also define urban agglomeration and demonstrate empirically, the benefits arising from population and firm density.

Population size and growth is closely related to employment growth and variety. With the exception of the 'recent period' (1996-2006) of population growth, the research-confirmed differential in favour of the GDA is 65 Basis Points (BP). This is not confined to the 30-year 'traditional' period (1966-1995), but extends back to the commencement of Irish census-taking.

In this section the following issues are addressed:

7.2.1 The Importance of Scale

In addition to low corporate tax rates is the significance of scale economics in influencing cost-reduction, competitiveness and city-size. Furthermore, it is conducive to influencing the developing pattern in the location choice of major FDI firms, as confirmed by the series of recent IDA announcements. The population scale-size and demand for public services enhance the cost-benefit case for infrastructure, based on more intensive usage. In turn, this improves the vital issue of accessibility and its associated port-airport potential. These are some of the issues that promote the virtuous circle for city growth. Currently, as the world's third most globalised economy, Ireland economic future is dependent on export competitiveness. This is viewed as being essential to the state's prospects for economic recovery (ESRI, 2010).

The alternative to *cities is an overdependence on a 'backyard production' economy of inefficient and uncompetitive industry; cities are indispensable to regional growth*, is confirmed (O'Sullivan, 2009). Furthermore, in an economy of *punctuated equilibrium*, which O'Hagan (2005) ascribes as the NEG model that best fits the Irish economy, at a time when new industrial and technological path emerge, it is found that under such circumstances, the nature of those paths can be shaped in significant ways by the pre-existing landscape of economic activity (Garretsen and Martin 2010).

7.2.2 Location Preference

Ireland's demographic history and its links with economic geography as for other countries, *has evolved over decades* (Garretsen and Martin 2010). In analysing its present demographic and economic circumstances, scale size and density issues confirm the economic requirement for cities. Likewise, through pioneering NEG-related analysis, finds empirically for Ireland that strong location preference for specific new types of 'work' tends to be urban-based: employment where location is systematic, (Morgenroth, 2008).

To have a small number of cities, at one tier below Dublin's size, especially for an economy that is already so globalised, and thereby achieving spontaneous agglomeration in the RoS area so as to be able to compete globally; this should be made the imperative for Ireland's alternative spatial strategy. Such strategy points to the universal need to urbanise. The world population and its growth provide no other options for accommodating its people. That literature emphasises the responsibility for governments to *put in place, in addition to institutions, connective infrastructure, so that the benefits of rising economic density are more widely shared* (Zoellick, 2009).

As demonstrated in subject research, if the NSS strategy of BRD cannot spontaneously agglomerate, then, as Fujita et al. (2001: 348) query: *Is Europe really going to be able to maintain its polycentric industrial geography?* In turn, in addressing the key issue one, this research prompts a further question which will require deeper econometric-type NEG analysis that is outside the range of subject hypothesis. That is, could an alternative strategy of centripetal agglomeration or 'lumpiness' as advocated in Zoellick (2009) provide the answer to Ireland's spatial settlement needs?

This research has confirmed that spatial policy strategy cannot depend upon the minimum agglomeration threshold population of 20,000-40,000 or even 100,000 as the suggested target range levels for Gateways or Hubs, as specified in the NSS (2002: 40). Yet the NSS expresses doubt as to whether some of the nominated settlements can attain these targets by 2020, intended so as to provide the range of services or similar central place status, so as to counterbalance Dublin's economic success. The demographic analysis of this research confirms that this is neither plausible nor tenable.

7.2.3 Summary of Issue 1 – The Imperatives of Scale

To summarise the synthesis of this issue : unless the state has ESDP-sized cities, essential to emerging NEG–type economic activity, over reliance on Dublin alone within a highly globalised economy, cannot be offset or substituted by a diluted BRD strategy policy-application to the existing, modest-population range of Irish settlements. The inconsistency of this stated compact dispersal model, particular for RPGGDA implementation, is pertinent to the considerations of the next issue.

7.3 Issue 2 – Synthesising the Role of Urban Hierarchy

In considering the role of Ireland's urban hierarchy, its structure and distribution, as being the driver of future economic development, this research has shown that during 1966-2006 there has been a significant widening in the size and density gaps between Dublin and the state's embryo cities. The empirical research on this issue has implications, not only for the future economy but particularly for increased divergence between the population growth of the GDA and the RoS area and of its settlements.

This section contains the following issues:

7.3.1 Rank Size applied to the Urban Hierarchy

The rank size analysis provides empirical evidence of a 'missing' second tier of settlements in Ireland – of a scale size at which Bergovic (1991) states that urban agglomeration spontaneously commences. Particularly for a services-dominated economy, Fujita (1989) confirms that the minimum threshold population requirement for agglomeration to occur is up to twice that of an industrial-based settlement. This in turn suggests that despite Ireland having an excessively-primate city, as per Henderson (1989), when this is combined with having a particularly low population density elsewhere, such condition raises another question. Has the pursuit of BRD been in Ireland's best economic interest? The research-proven absence of a second tier of cities and the widening in the population scale-gap answers that question.

This research has examined the Alonso (1971) model's micro-economic affirmation – whereby under 1970s industrial-dominant economic circumstances rather than those of a 2010 services-dominant one, that model's lowest inflection point A occurs at a population of at least 100,000. Over the intervening four decades, advanced economies have become service and cerebral rather than the industrial and physical ones. Accordingly, with the advent of NEG, Alonso's inflection point A (and likewise B to E) indicative minimum population size has doubled or trebled, distended along its X-axis, *as localisation economics move towards urbanisation economies, responding to the agglomeration effect* (O'Sullivan, 2009).

7.3.2 The GDA is a Monocentric Region

Empirical research findings by DIT's Futures Academy confirm that the absence of ESDP-sized cities in the RoS area has accentuated the eastward direction in the state's demographic centre of gravity. In turn, this is likely to magnify the future size difference with faster-growing GDA town settlements. Yet, from research using a standardised polycentric measure, their principal finding is that the GDA together with county Louth represents the least polycentric-developed of all eight north-west European city-regions, (Hall and Pain 2006).

Accordingly, commercially-monocentric Dublin, retains 88.60% of all APS-type jobs within that study area. This confirms that the primary functionality of its SoI towns, inside or adjoining the GDA, is that of serving as dormitory settlements. In turn, this shows that they are considerably below the threshold minimum population size for agglomeration to spontaneously occur, despite having achieved a much stronger average population-growth performance than their RoS town equivalents over the study period. Yet, over 1986-2006, the large and medium-sized GDA towns have had a much faster population growth than the RoS embryo cities, with the exception of Galway and Drogheda.[40] That applies to both the growth rate and average size of the three west-Dublin super suburbs.

[40] The major portion of Drogheda's population being in County Louth is RoS rather than GDA-based

7.3.3 Summary of Issue 2 - The Role of the Urban Hierarchy

This synthesis of issue two research finds that the weaker RoS area urban settlement population-growth, indicates that they are of insufficient size to generate urban agglomeration momentum or to be able to support the region's 'peripheral' economy, in the current difficult and prolonged economic circumstances; to the extent that Dublin's prospective recovery would be expected to promote growth in the 'core' GDA region. Thus, the absence of a second tier of settlement in the RoS area will find it all the more difficult to retain population. Accordingly, the resumption of a 'traditional' higher differential would appear to be more likely than the maintenance of the 1996-2006 'recent' low BP differential and thereby affirming the direction of providing a positive hypothesis outcome.

7.4 Issue 3 – The Emergence of the New Economy

This section synthesises the findings from earlier chapters as to how the state's progress towards a 'knowledge-based' cerebral-led economy might influence its future population and employment compositions. Likewise, the state's future spatial characteristics and their location requirements in such an economy are considered. Irish urban policy-led strategy to-date has been firmly centrifugal in direction in pursuit of polycentric objectives. For the GDA, this has led to accelerating medium and long-distanced commuting as SoI counties surrounding Dublin, and to a lesser extent the embryo cities, having responded to the demand for cheaper housing as in the Alonso distance for affordability trade-off. This has been magnified by decentralisation, the rejection of the Buchanan and ERDO strategies, and the continuing quest to retain Dublin as a low-height city. Brown-field intensive development activity has only emerged over the last twenty years or so.

In this section the following issues are addressed:

7.4.1 The importance of Density in the New Economy

It has also been shown that the new-economy requirements for density, economies of scale, innovative abilities, social interaction and other factors, in turn will exert greater influence over spatial compactness (Jenks et al, 1996). This research has shown that the state has declared its future as being a knowledge-based, high value, trading and export-led economy. It is today one of the world's most globalised nations. Yet spatially, with one ESDP-defined city and no urban agglomeration policy in place to promote the growth of a 'second tier' of settlements, its governments have been pursuing a polycentric policy of BRD with a dispersal model.

When combined with higher fuel costs and limited infrastructure investment-viable in the lower density RoS area, these all point to the possibility of a shift-change to centripetal forces dominance in the GDA.

7.4.2 NEG Appears not to be Understood

The qualitative analysis of subject research points to what was said, in showing the interviewees' unfamiliarity with NEG and to a limited familiarity with urban economics and its spatial implications. It was also established that the present political and policy systems are likely to resist significant short-term change to the state's mode of county governance. It has also demonstrated that in the case of Limerick, this does little to promote the growth-potential of individual cities. The NSS (2002) does not refer to urban agglomeration but instead seeks to promote linked gateways and linked-hubs, despite the modest scales of population and the considerable distances between such settlements, relative to their gravity mass or population.

It was also confirmed that future settlement strategy initiatives are likely to be constrained because of the overhang of real estate surpluses, particularly for residential and commercial property. The residential surpluses tend to increase proportionately with distance from Dublin (Williams *et al*. 2010a and 2010b). Neither is significant property development activity likely to commence prior to completion of the banking reform, a restoration of effective, affordable demand and the necessary absorption of excessive surpluses. Furthermore, because open market values are currently lower than construction replacement costs, generating nil or sometimes negative site values.

However, this will serve to heighten an awareness of issues such as location and end-use demand.

In particular, the qualitative findings of this research have identified an understandable absorption with current economic problems which encourages decision-making to tend towards maintaining the status quo. Accordingly, the consensus view is that long-term strategic policy formulation is thwarted.

Meanwhile, the research evidence from published CSO 2006 census data on town size, confirms an early-stage of an emerging Dublin's polycentric urban plateau; one that has swelled the growth of Ireland's largest residentially-dominated towns. In combination with the capital's emerging polycentric super-suburbs; together with the large towns, they are creating urban mass unmatched in scale anywhere else in the State, based on current settlement trend data from the 2006 census. Should this long-term demographic trend continue, particularly in a recovery era of low growth it is probable that the GDA will consolidate its current signs of developing as Ireland's sole metropolitan region and prospective city-state. This ongoing demographic trend path is reinforcing the research hypothesis.

The qualitative research found deep and understandable concerns for future economic outcomes that foster conservatism in decision-making at a time of economic survival. Cost and competitiveness factors should determine spatial characteristics and requirements. Accordingly, financial considerations as to return on capital employed and corporate survival strategies tend to accentuate a short-term focus. Inevitably, viability studies identifying diseconomies of scale, increasingly, will lead to a focus on spatial inefficiencies. Service cut-backs will make remote locations with sparse population density less affordable at a time of scarcer resources and incomes.

7.4.3 Summary of Issue 3 - The Emergence of the New Economy

In summary, there was little consensus that given such economic impacts on the RoS area's comparative low density and weak settlement hierarchy, as Ireland continues to urbanise, pro-rata that this will widen the population gap between Dublin and other settlements. Should its policymakers persist with the European Polycentric model and its associated BRD objectives, the NEG literature findings would suggest that the RoS

area will not gain the benefits from urban agglomeration that it could otherwise achieve. This leads to the conclusion that if the state wishes to aspire to a high-value, knowledge-based economy, there appears to be a need to review and if necessary, to replace BRD strategy policy implementation with an alternative, centripetal, city-focussed agglomeration model.

7.5 Issue 4 – Consideration of the Consequences for Future Public Policy and Possible Spatial Scenarios

In synthesising the prospects for future policy direction based on prospective, realistic scenarios, the discouraging previous history of policy rejection may be balanced by the encouraging fact that a suite of state, regional, county and local spatial planning strategies have been in place for nearly a decade. However, their effectiveness has yet to be fully evaluated, perhaps with the exception of the Fitzpatrick (2009) study. At the same time there is a growing literature of criticism of the NSS policy, as set out in Appendix 5. Furthermore, the depth of this recession and the prospective length in time for recovery is tending to place an increasing governmental focus on immediate issues and to their problem-solving.

Up to the introduction of the NSS in 2002, Irish spatial policy formulation had been eschewed because of the political unacceptability of earlier spatial planning recommendations; they were antipathetic to the prevailing political objectives. In a review of the state's regional policy up to the millennium, O'Leary (2003: 15) evaluated its effectiveness. He found that there was a disinclination by government, to implement an effective urban-based strategy, because of longstanding cultural antipathy towards cities. This issue was also raised by some interviewees, *vide* Chapter five as to the rural-centric focus of the two main political parties.

In this section the following issues are addressed:

7.5.1 Incompatible Policy Objectives

In this, O'Leary (ibid) finds that public strategy has attempted to implement two *incompatible* policy objectives: to maintain national growth and competitiveness while simultaneously, trying to achieve BRD. The twin objectives are mutually exclusive. O'Leary's significant conclusion is that because Ireland is a regional economy, BRD serves merely a "distributive" function – i.e. it is a form of decentralisation, rather than being a key influence on economic growth. Also, there is little or no realisation amongst political decision-makers, that it is the competitiveness of firms rather than that of dispersed settlements that are the key influencers, particularly for FDI firms *(ibid)*.

Deteriorating employment trends have placed a focus on the 'old economy' and have highlighted its labour-skills requirements and the supply of potential employment and their locations. A series of public debates have raised questions and calls for public inquiries on economic mishandling or wrongdoing. Yet, the tenor of such focus suggests that whilst this pursuit is strong, there a lack of focus on the urgency to confront the challenges ahead; ones that relate to the developing new economy.

The outcome to these questions appears to be removed from the new economy's focus on increasing returns and with agglomeration economics, in contributing to regional growth, (Angeriz, McCombie and Roberts 2009). Whereas they do not specifically deal with population convergence, nevertheless this literature confirms that *with constant returns to scale, there should be an expectation of slow convergence of per capita income levels as regional or international integration progresses. However, with increasing returns to scale, strong forces making for divergence can be expected (ibid).*

Ireland's current economic 'correction' will result in increasing returns to scale, with emphasis on cost reduction and improved competitiveness. However, this is unlikely to prevent the occurrence of further divergence between the 'new economy's' FDI sector and the laggard elements of the old.

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O'Leary notes that during the early part of the Celtic Tiger era, BRD has regressed, as shown in his own empirical analysis of 2002 which deals with overall productivity (growth) of regional divergence. This, he states, as being primarily due to *productivity growth in the internationally competitive, mostly foreign-owned multinational*

companies in the high technology computer, electronics and pharmaceutical sectors concentrated in the regions with major urban sectors, like Dublin, Cork and Limerick (O'Leary, 2002: 19). He questions the rationale used for the choice of gateways and hubs *based exclusively on location and the availability of a critical mass of population with associated services.*

Maintaining national growth and competitiveness continues to be the Government's main objective whereas BRD is viewed as a just one of several 'distributional objectives' and hence is *given low priority, being managed by the Department of Environment and Local Government and not by the main economic ministries (ibid).* This is particularly significant given the emergence of NEG with urban economics, spatial planning and real estate development.

Also noted is that *the NSS is weak on implementation as it does not contain specific measures, but rather requires government departments to integrate the NSS into their policies* (Morgenroth, 2003). He stresses that 'growth' (national) and 'redistribution' (local/ regional) objectives should be decoupled, noting that both regional and local Government have played minor roles in Irish economic policy formulation. This is further confirmation of the centralist nature of Irish governance.

7.5.2 An Urban Example of Recent Demographic Divergence

Research findings from this thesis conclude that consideration of possible future scenario feasibility may be more constrained – and hence their negligible prospects for implementation - than at first appears due to ever-widening population gap between Dublin and other settlements, magnifying the difficulty in creating sustainable BRD. The unfavourable outcome in the 1996-2006 aggregate growth comparison of the three smaller embryo cities, when compared with Dublin's three Myles Wright-proposed western towns, evidenced in the analysis outcome of Tables 7.1 and 7.2., is significant, as confirmed , thus:

Table 7.1: Growth Performance of Dublin's New Western Towns: 1996-2006

Town	Eds	1996	2006	% Growth
Blanchardstown	10	54,547	85,324	+56.42%
Clondalkin-Lucan	10	61,800	81,551	+31.96%
Tallaght	15	70,231	73,769	+ 5.04%
Totals	**35** [41]	**186,578**	**240,644**	**+28.98%**

Source: CSO: Tables 6 and 7 of the 2002 Census – Volume 1, analysed by thesis author.

On a direct comparison of scale and growth performance it is noted that the three smaller RoS embryo cities of Limerick, Galway and Waterford had an almost similar 1996 average of 60,218. However with lower population growth their 2006 average was 70,900:

Table 7.2: Growth Performance of Smaller Embryo Cities: 1996-2006

City	Eds - Note	1996	2006	% Growth
Limerick	37	79,137	90,757	+14.68%
Galway	22	57,363	72,729	+26.79%
Waterford	38	44,155	49,213	+11.46%
Totals	**N/A**	**180,655**	**212,699**	**+17.74%**

Source: CSO: Tables 6 and 7 of the 2002 Census, as analysed by thesis author
Note: City Council area only.
Note: As the populations of these embryo cities overspill into Electoral Districts and part Eds of more than one other local authority – *e.g.* in the case of Limerick – the task of reconciling such defining boundaries is complex.

7.5.3 Summary of Issue 4 - The Consequences for Future Public Policy and Possible Spatial Scenarios

To summarise the synthesis findings of this fourth issue, under current and prospective economic circumstances, the freedom of latitude for government policy implementation in pursuit of BRD is increasingly constrained. Opportunities to generate urban agglomeration, apart from Dublin, are limited realistically to a very small number of settlements because of the modest population scale in an increasingly services-based economy. The average size of the three New Dublin Western Towns is nearly 10,000 greater than that of the three small embryo cities (*vide* Tables 7.1 and 7.2).

[41] Sometimes there is uncertainty in defining the extent of these towns. In the case of Blanchardstown, the ten EDs (Electoral Divisions) include 'Knockmaroon' and 'Park' in Castleknock: Clondalkin includes the three Lucan EDs: Tallaght's fifteen EDs include those of Ballyboden and Bohernabreena in the above analysis (as per ED populations, Volume 1, Census of Population, 2002).

Population growth will continue to track employment creation and the 'at work' total is likely to maintain a downward trend in the short-term. The longer-term range of scenarios based on interviewee findings suggests that there will continue to be little or no political will to establish city-based regions. This, in turn, reduces the prospect of attaining significantly grow in the embryo cities. Under these circumstances, this research finds that under the NSS, both the larger settlements and the six planning regions outside the GDA – with exceptions such as Galway and perhaps Drogheda - will continue to under-perform, further widening the population gap-size with Dublin and the GDA.

7.6 Issue 5 – Future Public Policy – a Scenario of Possible Outcomes

This final key issue for consideration concentrates on future governance. Should Ireland's sovereign debt crisis deepen in its government's efforts to reconstruct bank capitalisation, the ensuing loss of economic sovereignty imposed by an unserviceable national debt and continuing budgetary deficits, could dilute or constrain state decision-making powers. Instead, a future scenario of reduced independence of decision-making powers resulting from an EU, World Bank or IMF-led intervention, together with other expert external assistance, would re-direct future policy towards spatial-economy and NEG-driven principles to be applied in the rescue strategy policy-making direction. This would ensure that disconnect within government, and between economic and spatial policy would be rectified.

In this section the following issues are addressed:

7.6.1 Loss of Economic Sovereignty - The Cost

Concluding this scenario, where the independent financial sovereignty of the state having already been compromised, *inter alia* by the issues identified in these research findings related to past and present spatial policy inconsistencies and their failures. Such issue-solutions would be presented to the Irish government as a condition for

implementation, perhaps based on financial sanction-directives. Under such scenario it is possible that the intervening authorities might include people of the influential and stature of Zoellick (World Bank) and Krugman (NEG Economist) in becoming members of a 'reconstruction team': people who understand and apply NEG policy.

7.6.2 Summary of Issues on Spatial Findings to be addressed at Governance Level

Under such a scenario, at least some of the following spatially-related issues associated with the findings of this research would be addressed at governance level, thus:

- To establish a basic minimum scale-size settlement target so as to promote urban agglomeration and enhance competitiveness given Ireland's exposure to globalisation,
- Optimisation of the urban hierarchy, its structure and distribution, as a driver of future economic development for Ireland's skills-upgraded labour force,
- To direct spatial policy in a direction that would foster the 'new economy' given its spatial characteristics, its demography and its city-growth requirements,
- To seek to rectify past outcomes, arising from unsuitable, incompatible and contradictory spatial public policies
- To address the domain of future spatial planning, necessitated by Ireland's financial, population and employment circumstances and its desire to grow the new, knowledge economy.

7.7 Synthesis Chapter Conclusions

This synthesis has found that what might otherwise have been just an academic exploration of emerging urban economic and associated NEG theories with possible future policy application; has now become a reality because of the urgent need to address the fast-unfolding, grave financial and economic circumstances confronting the Irish economy. The body of research has shown that there still is reluctance by state centralised political and governance systems and its spatial policy-makers, to advance forward from past failed spatial policy which this research has identified and analysed; for the key issues that have become 'front line' ones that require prompt attention.

With the exception of Dublin and the GDA, and in the absence of ESDP-sized cities in the RoS 90.05% surface area of the state, this research has established that the opportunities to generate the benefits that flow from urban agglomeration are largely absent and unrecognised by decision-makers.

These findings from the qualitative analysis also confirm that there is, as yet, no general political ambition to change the state's present governance from its present rural-centric policy direction. Yet, this research points to a wealth of international literature which clarifies the policy issues and requirements that need to be addressed. The fusion of economic and geography theory, endorsed in the Nobel Prize award conferred on Paul Krugman, serves to confirm the establishment of NEG and its analytical tools in pointing the way ahead for decision-making and implementation, so as to achieve a city-led knowledge economy.

CHAPTER 8: RECOMMENDATIONS

8.1 Introduction

The final chapter commences with a concluding discussion on the pivotal research question as it relates to the research findings. Then it examines what is the likely hypothesis outcome from continuing with the present NSS distributive focus on achieving spatial balance. The application of NEG or the consequences from ignoring it are addressed. It then draws conclusions on the alternative 'lumpiness' policy for competitiveness which is the objective of centripetal agglomeration, noting the potential political and governance inhibitors. The chapter details the limitations of the research with recommendations on issues for consideration by government. Finally, it suggested future research areas that flow from this thesis.

8.2 Concluding Discussion on Findings

The overall conclusion from this research is that despite an urgent need to so do, there is neither a political nor governance will to change the existing spatial system. Furthermore, there may be related EU issues associated with Ireland's commitment to the European Spatial Development Perspective.

In this section the following issues are addressed:

8.2.1 The Pivotal Research Question

8.2.2 The Outcome from Retaining the Spatial Strategy *Status Quo* or for a new beginning?

8.2.1 The Pivotal Research Question

The pivotal research question: *Can the GDA long-term differential population growth to that of the RoS area result in a 50% convergence of their respective populations and if so, when might this occur,* was addressed in earlier chapters in the context of the five identified key issues. Historically, having a modest home market which limited its ability to consume only a small proportion of the state's production-potential, this informed the late 1950s policy decision to become an export economy, in turn leading to its current

position of global dependence as a trading state. In order to protect and further expand its export base Ireland is obliged to become much more price-competitive and knowledge-skilled.

This research has identified the structural problems of low population density and the ensuing diseconomies of scale which penalise economic competitiveness. With only one European sized metropolitan city region and a sparse population density scale in the remaining 90% of the state, all other areas are competing with each other for limited resources. Thus, the political system is inevitably distributive-focused (O'Leary, 2003).

Shortly after the commencement of the study time-frame in 1966, the then government's rejection of the recommended spatial policy has rebounded economically in recent times, the consequences of which include not having ESDP-sized cities in the RoS area. The Buchanan Plan was designed to rectify the settlements imbalance that might have resulted in having two intermediate-sized settlements, Cork and Limerick. That rejection means that over forty years later, there is a missing tier in the urban hierarchy; that vital tier size at which the virtuous circle of urban agglomeration begins to occur in a services-based economy.

The gravity of Ireland's current economic recession may provide an unwelcome, yet enforced opportunity to likewise reject the spatial-polycentric, distributive policy of BRD and instead, to replace the NSS with one that pursues centripetal agglomeration. To replace 'balance' by a much more uneven 'lumpiness' as the preferred spatial policy, would, in turn direct more of Ireland's people into its embryo cities resulting from concentrated investment leading to UA. In turn, this would bring more of its population to reside closer and thus more sustainably, to a population size where NEG theory indicates that the future, successful knowledge economy will be concentrated.

Ironically, if Ireland's embryo cities could reach the minimum threshold size of 200,000 to 500,000 whereby urban agglomeration could commence, that virtuous circle of city population growth and the consequent morphological 'lumpiness' would have enabled Cork, Limerick and perhaps Galway to counter-balance the GDA and thereby bring a real geographic balance. The Edward Walsh-proposed 'Atlantic Technopolis' is

unlikely to succeed because of the combined factors of population, distance and the geometry of their location relative to one-another.

The 2006 census populations of both Limerick and Galway are of themselves, much lower than the aforementioned minimum threshold when compared with the clustered-cities of Germany and the Netherlands. Unlike the cases of the Ruhr or Randstad, the modest Irish populations are too small and their distances from each other and from Cork are too large. Thus, there is no evidence of recent population growth, of a level or intensity to provide confirmation that urban agglomeration has commenced. Furthermore, in order to achieve a clustering effect, the locations of the Irish embryo cities would need to be in a triangular plain as against their linear configuration – and even more so when the forth 'embryo' Waterford is added (*vide* Zoellick, 2009 on the combinations of Density, Distance and Division). With regard to division, the majority of interviewees doubted as to whether the idea of replacing counties by city-based region would ever find favour with either the governance system or with the current philosophy of the two rural-centric main political parties.

8.2.2 The Outcome from Retaining the Status Quo or for a new beginning?

Given the prospective direction of the Irish economy, its population and settlement structure as explored in this research, in this final chapter it is instructive to consider the future spatial strategy option, for BRD or to choose Lumpiness? Other spatial strategy options may also be available However, given the fact that the existing one is EU-driven and that the US and World Bank propose the latter policy, given Ireland's location it is probable that the realistic choice is between these two.

This qualitative research herein confirms that there is little political will within the state to make such a long-term policy change: all politics being local and short-term in focus. On the other hand the quantitative research reinforces the need for its urgent consideration as already discussed. The real and prospective loss of economic sovereignty could however, present an opportunity for an externally-imposed strategy policy change. However, such a scenario may not occur if the present banking crisis can be resolved and national debt can be controlled despite a contracting economy's ability to raise taxation at the expense of further economic contraction.

Assuming that Ireland retains its economy sovereignty and continues with its BRD settlement strategy, the *status quo* would remain with the GDA alone continuing to benefit from urban agglomeration. It would continue in maintaining its long-term higher differential population growth, and in the absence of agglomeration elsewhere, it will command an ever increasing portion of state population. On that basis for the GDA, the convergence path of the pivotal research question would continue, on the assumption that the 'traditional' BP growth rate differential is restored and is maintained until such convergence takes place. Here the presumption is reinforced by the fact that future spatial policy intervention is not attainable, based on the findings (O'Leary, 2003) that *there is a distinct possibility that the objectives of BRD and improved national growth and competitiveness may not be simultaneously achievable*.

Instead, that author states that both of these 'incompatibles' need to be replaced by one unifying strategic objective: namely, one *that combines national growth and competitiveness* – with a focus on developing the modern economy. Due to space constraints, thesis author's modified scenario based on and additional to the O'Leary (*ibid*) literature, are detailed in Appendix 12, and are based on a Pareto, win-win optimality.

These research findings on demographic trends and on possible spatial outcomes will be of interest to the policy community, particularly in the light of Ireland's prospective medium-term economic future. In focusing on these issues, this research has identified serious inconsistencies and contradictions, both in policy formation and in its implementation. Critically, the qualitative research has also ascertained that there is a lack of understanding or an unwillingness to embrace the virtuous circle of urban agglomeration and to use it to develop an urban hierarchy where critical mass can enhance and prosper the peripheral regions of a small open economy.

Other research findings confirm that BRD is ineffective and is not working. In affirming that this is the case, a literature list of opposition continues to grow (*vide* Appendix 5). Likewise, the absolute size gap between the settlement population of Dublin and other urban centres continues to increase in successive censuses. The research has also confirmed that between government bodies – the CSO and DoEHLG - there are wide variations in future population projections upon which RPG policy decisions are being

revised. This research also points to ongoing political intervention in explaining the inconsistencies between the CSO figures and those being used by the DoEHLG for their Regional Planning Guideline Review (2009) projections.

8.3 Research limitations

The PhD format and prescribed discipline together with the researcher's restricted skills-set imposes constraints to the scope of this work. During the course of the research it became evident that deeper economic, spatial econometric and NEG-type analysis including the deployment of econometric techniques such as bifurcation analysis would be required for undertaking a normative-type study of the subject. This enforced the decision to adopt this positive approach utilising demographic comparison. Furthermore, the confines of the hypothesis and its pivotal research question limit the extent to which some related issues could be explored. This is a challenge for further, deeper research on this subject.

8.4 Recommendations and Issues for Government

Instead of pursuing the policy strategy of persisting with the administrative independence of individual counties, the alternative policy to select a small number of embryo cities in Ireland for potential fast-track growth, has been regarded as presenting difficult, if not insurmountable political challenges, confirmed in a 2008 interview with senior DoEHLG officials. However, given the deterioration in the country's finances and in adopting an economy-of-scale tack, it is interesting to note that a mid-year 2010 cost-savings proposal of a geographically-limited county senior administration-type amalgamation has already been mooted.

In considering the hypothesis of subject thesis it is important to clarify the essential difference between a city region (or metropolitan region) as described in Sokol, Van Egeraat and Williams (2008) and that of the city-state as envisaged by Peirce (1993). In measurable demographic terms a city-region is likely to be 'primate' in that it contains a core contiguous city settlement, one that is conspicuously more populous than other settlements together with considerations of monocentric and polycentric employment locations (per Hall and Pain, 2006). In contrast, today's city-state is perceived as being overwhelmingly primate, as exemplified by Singapore. Whereas Peirce (1993) is not precise as to population share, the subject hypothesis and working principles for tangible,

measurable purposes, posits an emerging Dublin city-state as one whose sphere of influence plus settlement population is 50% of that of the national state. For hypothesis-testing purposes the current SoI is taken to be the GDA, despite subsequent research showing that County Louth together with bounding sections of counties adjoining the GDA are now within the Dublin FUR.

Although Dublin's SoI approximates to the GDA, there is growing demographic and commuting evidence adduced herein, to show a somewhat larger, expanding surface area than that of the outer land boundary of the 'core' region.[42] The Towns Analysis, hereunder, confirms that in the RoS area closest to Dublin, the rate of settlement growth is more in line with that of the GDA. Overall, this tends is to accelerates the growth trend away from smaller towns and towards the city-based clustering (Jacobsen and McGrath, 2006; NESC 117, 2008). Internationally, Ireland in general and Dublin in particular, will continue to enhance location status, as the economy becomes less low-tech manufacturing-dependent and more high-tech, export-oriented and knowledge-service-based in character (ESRI, 2008).

In terms of minimum settlement size, recent DIT research shows that by virtue of their plant size and skills requirements population thresholds for today's FDIs are significantly higher than was the case of the typical 1960-1980s Fordist era of low-tech manufacturing branch plant, (Skehan, 2007). *Competition for investment is now so fierce that the Irish economy will suffer if it is not able to offer a mega-city environment, with large scale market access, global connectivity, and quality of life. Investors will go elsewhere, vide* Programme and Papers, p. 71 (*Dublin – Belfast Corridor 2025*, 2003). Global city regions are a pre-requisite of the 21st century economy (Scott, 2001). Thus the quest for competitive advantage is one that Ireland cannot afford to ignore. Buchanan's (1968) perceptiveness and as it transpired, futuristic, observation on Dublin's exclusive role is even more relevant today: i.e. in an Irish context, in its unique ability to attract large commercial activity *that otherwise* would not come to this country.[43]

[42] See Williams Sheils and Hughes (2007) and Figure 6.4, *supra.*
[43] Thesis author has discussed with and noted the considered view on minimum labour-size requirement, formed by Mr Conor Skehan, Consultant Architect and Town Planner and DIT Lecturer in Spatial Planning.

The following bullet points detail augment the recommendations made hereinabove, thus:

- Finalise binding legislation so as to oblige county councils to conform to their respective RPGs.
- Adopt a single spatial planning strategy policy for the all-island context, given the emergence of the DBC, the strengthening of the Peace Agreement and further consolidation of North-South political arrangements. That the EU "Inspire" project results in comparable demographic data-sets both for administrations, north and south.
- Government adoption of positive-sum game policy in replacement of the centre versus periphery mindset.
- Reform local government to replace county councils with city-based regional authorities. Superimpose city authorities on multiple counties whilst reinstating all original country boundaries to their natural geographic parameters.
- Following publication of the findings of relevant Tribunals, to curtail the powers and role of local politicians, especially in relation to zoning of land and related Reserved Functions. Likewise, to oblige them to undertake compulsory academic and practical training in urban economics so that they will have an understanding of the powers of zoning but also of its associated responsibilities.
- For governmental consideration in regard to the ongoing workings of NAMA if it would be feasible to include within its remit, the formation of a National Development Agency to take ownership of all potential development land.
- With the establishment of NAMA, in consultation with An Bord Pleanala, to conduct an investigation of the cost of excessive zoning and to identify and quantify the sources of undue political interference; likewise repeated by Kitchen (2010).
- Formulate a rigorous Green Belt Policy and curtailment of urban-generated development in rural areas.
- Review the Kenny Report (1973) and the recommendations of ALPOCC 9 in the context of previous recommendations.
- Official Designation of Dublin as the National Growth Centre in the revised NSS
- Establishment of a single Land-Use and Transportation Authority for the GDA.
- To undertake a detailed review and if found necessary to curtail the reserved functions of local politicians.

- To place strategic spatial planning on a footing that is politically-proofed, akin to the Local Appointments Commission.
- Review the demographic growth performances of the NSS Gateways with a view to reducing their numbers to the five cities and three other centres. To consider including strategic towns that were ignored, such as Portlaoise, Kilkenny and Drogheda.
- Rationalise and reduce drastically the multitude of development agencies including IDA, Enterprise Ireland, Uadaras na Gaeltachta, FÁS, Forbairt, Forfás and Shannon Development so that job creation, innovation and training functions can become more rationalised and focused at a state and local level.

8.5 Applying the New Economic Geography (NEG)

This research has confirmed that NEG is increasingly indispensable in the way it has developed alongside spatial econometric analysis over the past thirty years, particularly wherein increasing returns to scale and imperfect competition can be incorporated into formal economic models. Given the emphasis and use of demographic analysis in subject thesis, it would for example be invaluable and exciting to be able to apply regional employment quotients based on current census population data.

This section comprises the following issues:

8.5.1 Reshaping Economic Geography – in Ireland

The findings of research indicate that the unprecedented, momentous demographic changes that have occurred in Ireland 1996-2006, are likely to have a profound influence in the direction of its future growth in demonstrating the state's ability to achieve short-term rapid growth by way of in-migration, however sustainable this is over longer time periods. Most such changes should be amenable to measurement and to projection into the future. The problem, however, is to determine the effectiveness of public policy strategy, by applying quantitative analysis, including NEG and spatial econometrics, so as to measure their effectiveness

Subject thesis has drawn on demographic data sets and the resultant analysis has made some grounding contribution towards this objective. Econometric-type analysis on demographics, such as that of Morgenroth (2008 Draft), is one of the first such applications to focus on the state. That literature confirms that *only a few research papers have analysed the spatial distribution of economic activity in Ireland.*

Likewise, there is support for the view that focusing on the economy isn't everything (Sassen, 2001b). Supporting the link between governance and culture: Friedman (2005) argues that *it is not possible to analyze a country's economic performance without cultural and mindset considerations: to whatever is open to foreign influences and ideas.* It is recognised by this researcher that sustainable development and futures must take on board political and environmental – including climate issues - as well as social and economic ones (*vide* Zoellick, 2009: 34).

Because of its limiting demographic scale and the state's political system, it has been demonstrated in this research that decision-making tends to be short-term and local, as exemplified by the discordant and dispersed locations of Government Decentralisation in a policy contradiction to those of the NSS.

However, given Ireland's population distributed and its propensity for migratory oscillations, demographic considerations are vital to the consideration of its future spatial policy direction, especially for its cities. It was observed by one senior DoEHLG interviewee that a reason for successive governments' neglect to address cities is due to foreknowledge and a lack of will to address the significant capital expenditure requirement for unavoidable and necessary infrastructure. The urgent case of Cork's downstream flood and its upstream reservoirs defences was highlighted by one of the DoEHLG interviewees.

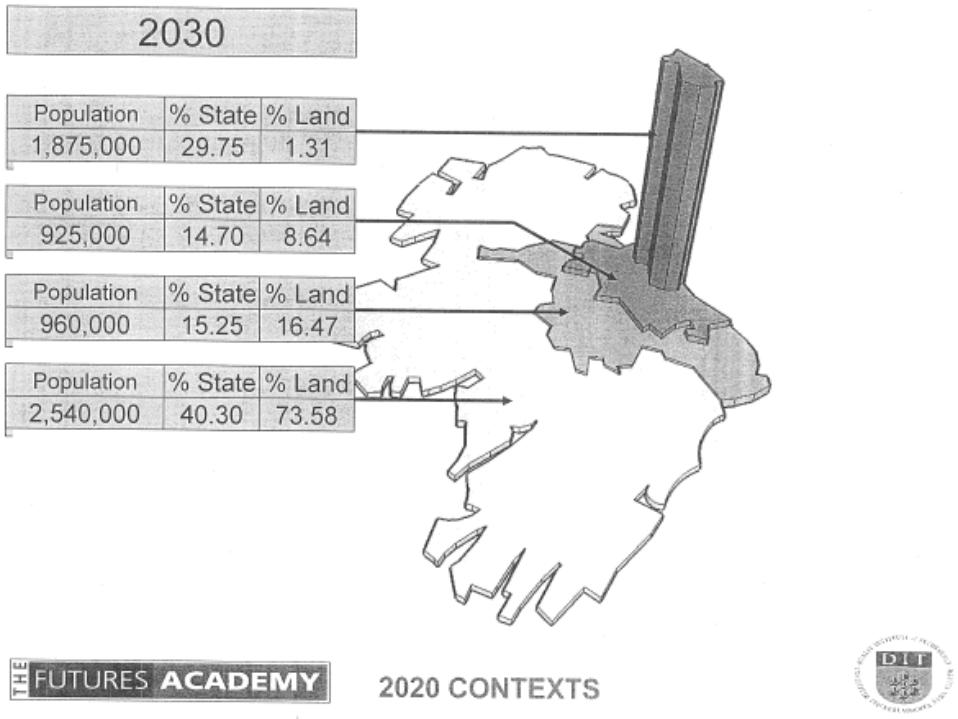
Accordingly, it is left to further normative-type research to consider if is in Ireland's best interest that centripetal agglomeration strategy policy of densification should replace that of the EU-ESDP-preferred BRD, *supra* P. 14. A persuasive case for both national and regional spatial policy formulation, to replace 'balance' by 'lumpiness' is argued (Zoellick, 2009, *ibid*.

Thus given Ireland's unusually low population density for a temperate location and having regard to its current economic 'plight' and the absence of the virtuous circle of growth causation, with the emergence of NEG and its focus on agglomeration, should not a priority policy objective be that of accelerating the population of its cities, already discussed?

For instance, there may be inhibiting factors which contribute to the reluctance at Irish government level to confront these issues. On such inhibitor is that even if the government were to accept the findings from this research, that BRD does not promote the case for urban agglomeration in the low population density of the RoS area and thereby encouraging it to explore the alternate policy for pursuing centripetal agglomeration, is this primarily because the EU-ESDP is considered to be non-negotiable for a member state? Alternatively, in making provision whereby BRD may be debated or challenged as in the case of subject research? In turn, is the reluctance to challenge the effectiveness of BRD due to a mindset that assumes that to do so could be seen as abandoning *zero-sum game* at the county level which is politically ingrained? The alternative approach would require an acceptance of *Pareto optimality* requiring the adoption of a long-term strategy policy which may be problematic, especially for short-term political survival.

A semi-structured interview with one of the Dublin contributors to the Hall and Pain (2006) research, Williams (2004) confirms that Dublin's FUR area effectively covers much of Louth as well as parts of outer Leinster counties and encroaching into south-east Ulster counties (*vide infra* Figure 8.1). The capital's increasing geographical SoI, for commuting and business to that extent, reflects the emerging Dublin-Belfast economic corridor, beyond the confines of the GDA. This again is politically-sensitive, given the experience of the dismissive rejection by government as its response to the publication of the DIT *Twice the Size* study in 2008, vide Figure 8.1, thus:

Figure 8.1: Prospective Population Outcome by 2030



Source: Twice the Size (2008)

8.5.2 Exploring a Possible Irish Application

The thrust of this research takes the positive route in contrast with the Losch-preferred normative approach which might have led to a modified pivotal research question to ask, if is it in Ireland's best interest that Dublin should be allowed to become its city state of the 21st century? That alternative, normative, approach is dependent on data availability which is indispensable to the field of NEG, the new economic geography: the study of spatial distribution of economic activity. Historic spatial economic data has always been problematic (Morgenroth, 2008 (draft)).

Through the use of the Tomahawk Bifurcation, from the Krugman (1991) model, it may be possible to determine for the future GDA and the RoS area, whether they are in a stable or unstable equilibrium, thereby obtaining a better understanding of potential convergence or divergence over time, *vide* Figure 1, Appendix 2 **'**Economics and Geography: How Krugman contributes to NEG and to the understanding of agglomeration'.

8.6 Future Spatial Units: Settlement or Sphere of Influence Population?

Particularly in the Irish context for future spatial strategy policy, making a distinction as to the narrower 'settlement' or alternatively, to the wider SoI population criterion is important, as the following analysis shows a considerably reduction in the population size- difference between the Dublin region and the provincial city or gateway regions as nominated under the NSS when compared with a settlement-only basis of population measure. That difference, for aggregate totals of all other gateways is computed hereunder in Table 8.1. In both columns, Dublin is weighted at 100. In the centre column the aggregate settlement census population is 50.11% that of Dublin whereas in the right-hand column which includes the SoI, it is 78.85%. Accordingly, the SoI measure shows a 57.35% more favourable comparison when compared with the measure that limits the analysis to just settlement population, thus:

Table 8.1: Settlement and Sphere of Influence (SoI) Populations and their relative percentages (Dublin = 100)

Settlement	2006 population and %	Sphere of Influence population and %
Dublin	1,045,769 (100.00)	1,735,000 (100.00)
Cork	190,384 (18.21)	411,000 (23.69)
Limerick	90,757 (8.68)	285,000 (16.42)
Galway	72,729 (6.95)	205,000 (11.82)
Athlone-Tullamore-Mullingar	48,887 (4.67)	148,000 (8.53)
Waterford	49,213 (4.70)	117,000 (6.74)
Sligo	19,402 (1.86)	72,000 (4.15)
Dundalk	35,085 (3.35)	66,000 (3.80)
Letterkenny	17,586 (1.68)	64,000 (3.69)
Totals (excluding Dublin)	**524,043 (50.11)**	**1,368,000 (78.85)**
Totals (including Dublin)	**1,569,812**	**3,103,000**

Source: 2006 census and Table 5.7, NESC 117, as modified by thesis author.

Note: The combined SoI at 3.103 million represents 73.19% of the 2006 total state population. The Planning Regions encompass the entire population, as per Table 8, Vol. 1, CSO (2006) census. Significantly, this would indicate that 26.81% of state population is outside the SoI of Gateways and hence, the NSS introduced a second tier of 'hubs'.

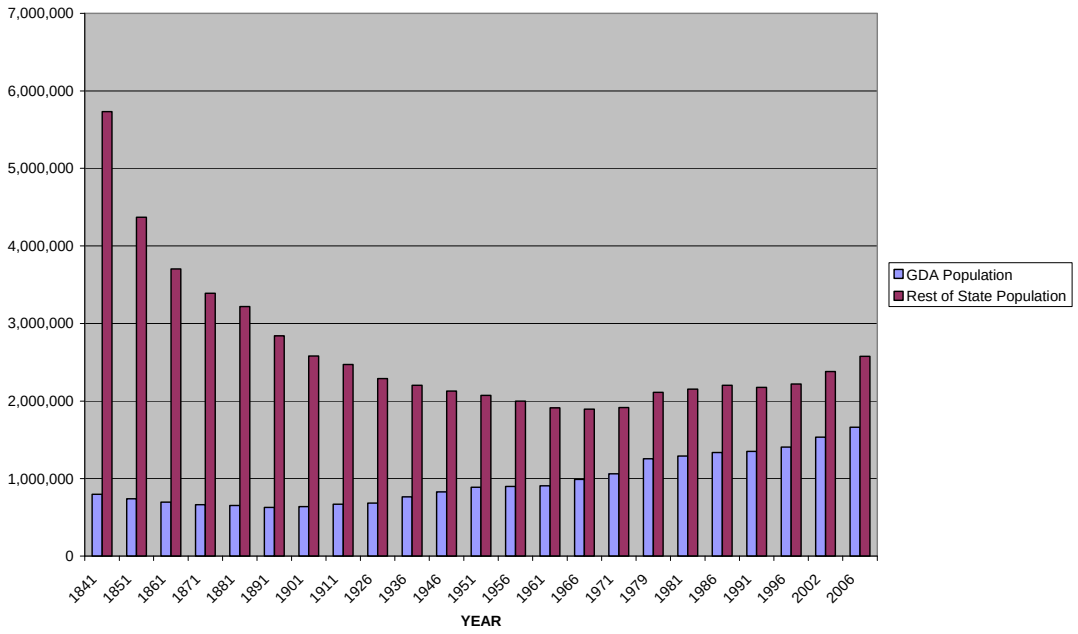
The earlier comparison of population size and growth, as between Dublin's three western towns and the three, smaller embryo cities (*vide* Tables 7.1 and 7.2) also is persuasive in this regard. Other fast-growing and densifing suburban settlements such as Sandyford, Cherrywood and Swords complement Dublin's vibrant Primary Development Clusters

exemplified by fast-growing Maynooth-Leixlip-Celbridge also reinforce the point. Here, the literature of Bogart (1998) is conclusive as to the future thrust of centrifugal urban format, particularly in the USA. The subject thesis has pointed to this thrust of Irish settlement evolution; one to-date that is more comparable with 'Boston' than 'Berlin' morphologies.

8.7 Outcome to Thesis Hypothesis – Graphical Presentation

In displaying the central finding of the thesis hypothesis population projection, the following Figure 8.2 shows a graphical presentation of the historical population growth-track back to the first census taking of 1841. Although thesis time baseline of 1966 coincides with the lowest point for the RoS area population, it is noted that the 1971 census marks the low point for the state's rural population – not shown on graph.

Figure 8.2: Long-Term Graphic Comparison of GDA with RoS Population (1841-2006)



Source: CSO Census 2006. Analysis: Thesis Author, partly based on Table 1.1 data.

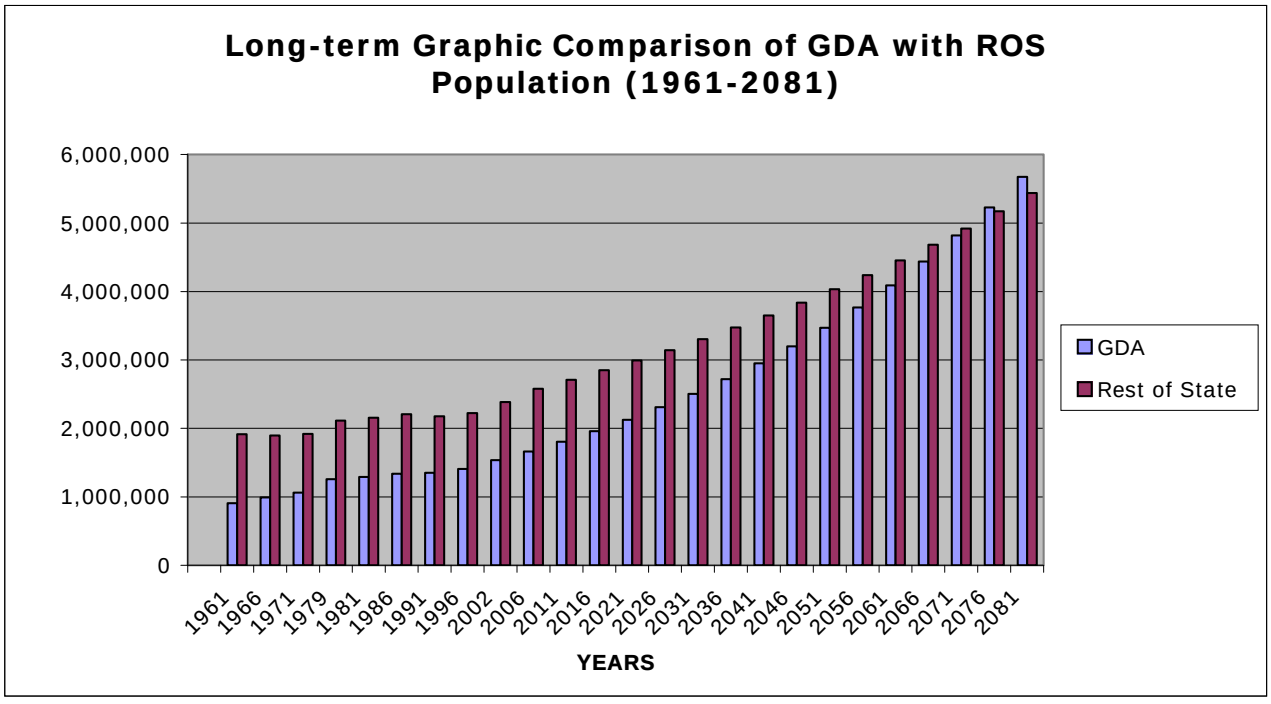
The following HYMOC-based spreadsheet of population projections for the GDA and RoS areas to 2081 assumes a 65 BP advantage to the former and in so doing, would result in convergence, as discussed, some 68 years after the 2006 census. After Figure 8.2 we show the final thesis Figure 8.3 in which the same projections are graphed with

the GDA line in black, the RoS in pink together with the overall State populations shown in yellow.

In speculating as to the line shapes of this final thesis graph over the next 75 years to 2081 the evidence over the past forty years suggests that the State as part of this offshore island is likely to experience uneven growth in the form of further steps and pauses, if not there is a likelihood of significant future population contractions.

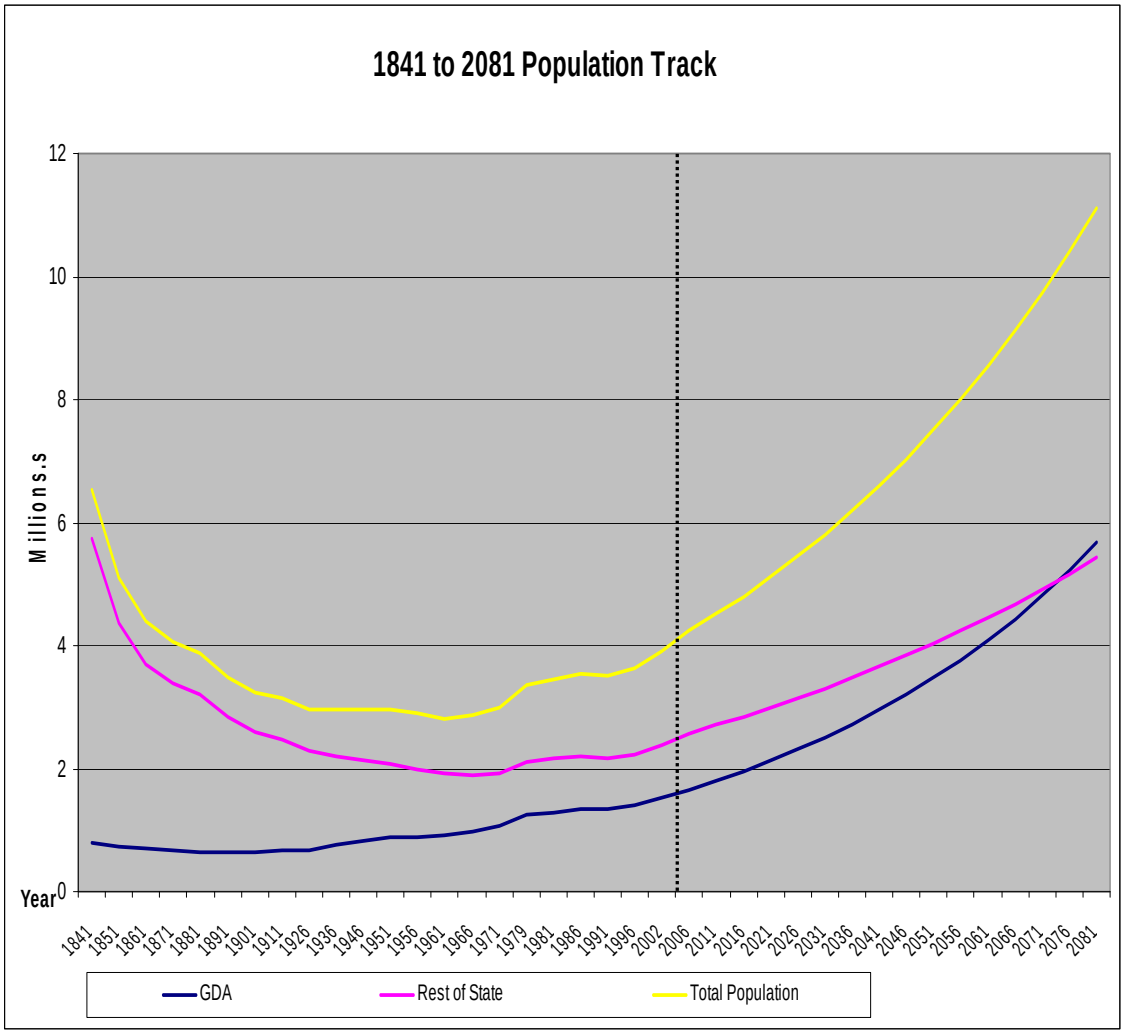
As its population base increases, it could reasonably be anticipated that the State's propensity for growth-oscillations will tend to reduce. Externally generated pressures will increase in line with world population growth and considerable further cycles of net in-migration should be anticipated, especially given the critical establishment of ethnic "bridgeheads" since the 1996 census. In addition to ongoing migration are the prospects for more robust natural growth outcomes are likely to be assisted by longer life-spans and improved healthcare.

Figure 8.3: Projected Long-Term Graphic Comparison of GDA with RoS Population (1961-2081)



Source: CSO Census 2006 together with author's HYMOC projections.
Analysis: Thesis Author based on maintaining a 65 Basis Point population growth differential in GDA's favour after 2026 here shown up to 2081, with convergence occurring in 2074 based on author's HYMOC model. The "Traditional" growth projection up to 2026 is the CSO projection based on the M2F1 central forecast in their Regional Population Projections, 2008.

Figure 8.4: Graphical Amalgamation Based on Figs. 8.2 and 8.3



Complementing the keynote thesis quotation from Fujita (1989) "*The theory of urban land use and city size is an especially appealing topic of study because much of traditional economic theory cannot be readily applied*", it is therefore appropriate to conclude with recent advice taken from the same author in Fujita and Thiesse (2009).

> *When the economy moves from dispersion to agglomeration, the rate of innovation tends to increase. Consequently, if the growth effect triggered by the agglomeration is strong enough, then even those who remain in the periphery will be better off.*

For 21st century Ireland, this thesis has shown that two intertwined outcomes are essential. First, adaptation of the necessary policy strategies to facilitate the positive sum-game *Pareto Optimality* approach and in doing so, for a knowledge-economy to achieve

the economic-payback factor merited and obtained from taking this bold initiative.[44] It remains to be seen if the necessary maturity of governance *cum* institutional arrangements will be realised whereby the outcome of a GDA demographic convergence occurs and in emerging as Ireland's prospective city-state towards the latter quarter of the 21st century, and in so doing, it enhances and re-invigorates the sustainable welfare of all-Ireland.

8.8 Suggested Areas for Further Research

The following are some areas for further research on this subject arising from this thesis:

- For both settlement and settlement–plus-SoI populations, to ascertain at what minimum thresholds do firm, industry and urban agglomerations commence?

- To ascertain if edge-city, super suburb-type development around contiguous Dublin is monocentric to an extent that may have caused to overshadow and reduce the short-term potential for SoI towns to establish a meaningful number of APS-type jobs, as identified in Hall and Pain (2006).

- To establish if, particularly in small-populated countries, does the primate city tends to over-dominate the potential for other settlements to achieve critical mass and to determine if this can this be reversed by replacing the spatial strategy of BRD with one of Centripetal Agglomeration.

- Despite their proximity to Dublin, how much more have large GDA towns yet to increase their populations so as to reach a minimum threshold size for APS-type employment to cluster?

[44] Future due-diligence processes for investigating economic-payback are likely to be more painstaking based on the experiences of the current economic and banking crisis. All such viability studies will be conducted with greater scrutiny and emphasis on pay-back potential, cash flow and end-use demand projections. Accordingly, supply-led projects and planning will tend to be viewed with greater scepticism. For example, Ireland is littered with unviable regional airports which have been built on the hollowed-out philosophy of hope rather than realism. And yet another such proposal, costing €200 million has just been announced for a 'Midland International Airport 'project to be located in a remote County Offaly location; one that is within and is intended to serve the ATM Gateway. Yet, it seems that end-use demand is not an issue of undue concern to its promoters or that the average taxpayer subsidy of €200 for every inter-regional flight is overlooked and ignored. Source: Morning Ireland, RTE Radio 1, 11th May 2009.

- Polycentric settlement size issue: does the Hall and Pain (2006) minimum 20,000 APS-type jobs at say 1:2.5 ratio of all jobs imply a polycentric town workforce of 70,000 ‘at work’ and thus require a settlement population size requirement of at least 150,000?

- The thrust of NEG theory is that both population and living standards at first will diverge as between the ‘core’ and ‘periphery region’ and eventually they will converge. In relation to Balanced Regional Development, to establish if there is a minimum country-level population, below which the implementation of BRD is an unsuitable or unsustainable spatial policy instrument, specifically under First World conditions?

- Could BRD be achieved in the absence of urban agglomeration conditionality?

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MAPS

Map 1: Map showing GDA, RoS, Cities and 34 Towns >10,000 population plus Identification Schedule of same 34 numbered towns in descending size order.

Source: CSO 2006 Census, Volume 1, Table 7, page 119.

City and 34 Large Towns Identification Schedule for Map 1 which is the schedule of > 10,000 population towns in descending order of size marked 1–34 on the above map (i.e., Town 1 is Drogheda and Town 34 is Midleton).

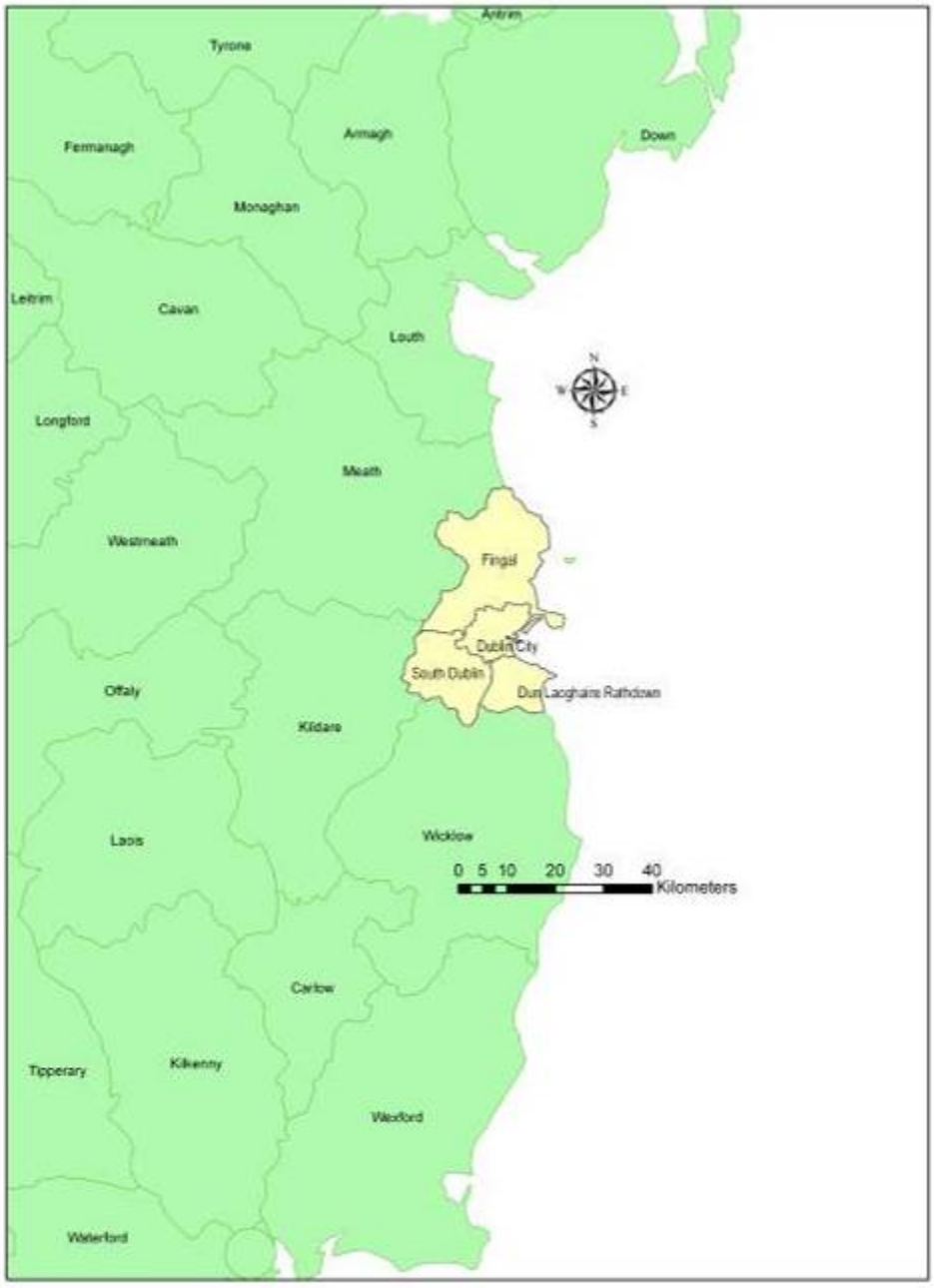
Table 7 Persons in each town of 1,500 population and over, distinguishing those within legally defined boundaries and in suburbs or environs, 2002 and 2006

Town	Total population (including suburbs or environs)		Population within legally defined boundary		Population of suburbs or environs		Percentage change in total population 2002-2006
	2002	2006	2002	2006	2002	2006	
Greater Dublin Area	1,004,614	1,045,769	495,781	506,211	508,833	539,558	4.1
Other Cities	386,136	403,083	287,511	290,119	98,625	112,964	4.4
Cork City	186,239	190,384	123,062	119,418	63,177	70,966	2.2
Limerick City	86,998	90,757	54,023	52,539	32,975	38,218	4.3
Galway City	66,163	72,729	65,832	72,414	331	315	9.9
Waterford City	46,736	49,213	44,594	45,748	2,142	3,465	5.3
Towns 10,000 population and over	551,863	615,925	360,419	386,027	113,085	140,151	11.6
Drogheda	31,020	35,090	28,333	28,973	2,687	6,117	13.1
Dundalk	32,505	35,085	27,385	29,037	5,120	6,048	7.9
Swords	27,175	33,998	–	–	–	–	25.1
Bray	30,951	31,901	26,244	27,041	4,707	4,860	3.1
Navan (An Uaimh)	19,417	24,851	3,406	3,710	16,011	21,141	28.0
Ennis	22,051	24,253	18,830	20,142	3,221	4,111	10.0
Tralee	21,987	22,744	20,375	20,288	1,612	2,456	3.4
Kilkenny	20,735	22,179	8,591	8,661	12,144	13,518	7.0
Carlow	18,487	20,724	13,218	13,623	5,269	7,101	12.1
Naas	18,288	20,044	18,288	20,044	–	–	9.6
Sligo	19,735	19,402	18,473	17,892	1,262	1,510	-1.7
Droichead Nua	16,739	18,520	15,749	17,042	990	1,478	10.6
Mullingar	15,621	18,416	8,824	8,940	6,797	9,476	17.9
Wexford	17,235	18,163	9,449	8,854	7,786	9,309	5.4
Letterkenny	15,231	17,586	7,965	15,062	7,266	2,524	15.5
Athlone	15,936	17,544	7,354	14,347	8,582	3,197	10.1
Celbridge	16,016	17,262	–	–	–	–	7.8
Clonmel	16,910	17,008	15,739	15,482	1,171	1,526	0.6
Balbriggan	10,294	15,559	6,631	6,731	3,663	8,828	51.1
Malahide	13,826	14,937	–	–	–	–	8.0
Leixlip	15,016	14,676	15,016	14,676	–	–	-2.3
Portlaoighise	12,127	14,613	3,482	3,281	8,645	11,332	20.5
Killarney	13,137	14,603	12,087	13,497	1,050	1,106	11.2
Greystones	11,913	14,569	10,303	10,112	1,610	4,457	22.3
Tullamore	11,098	12,927	10,270	10,900	828	2,027	16.5
Carrigaline	11,191	12,835	–	–	–	–	14.7
Castlebar	11,371	11,891	10,287	10,655	1,084	1,236	4.6
Arklow	9,993	11,759	9,955	11,712	38	47	17.7
Cobh	9,811	11,303	6,767	6,541	3,044	4,762	15.2
Maynooth	10,151	10,715	–	–	–	–	5.6
Ballina	9,647	10,409	9,478	10,056	169	353	7.9
Mallow	8,937	10,241	7,091	7,864	1,846	2,377	14.6
Wicklow	9,355	10,070	7,031	6,930	2,324	3,140	7.6
Midleton	7,957	10,048	3,798	3,934	4,159	6,114	26.3

Map 2: Showing the 32 counties of Ireland – Republic and Northern Ireland**.**

Note: The strategic location of County Louth within the Dublin – Belfast Corridor

Map 3: Showing the four ‘Administrative Counties’ of Dublin and Surrounding Counties

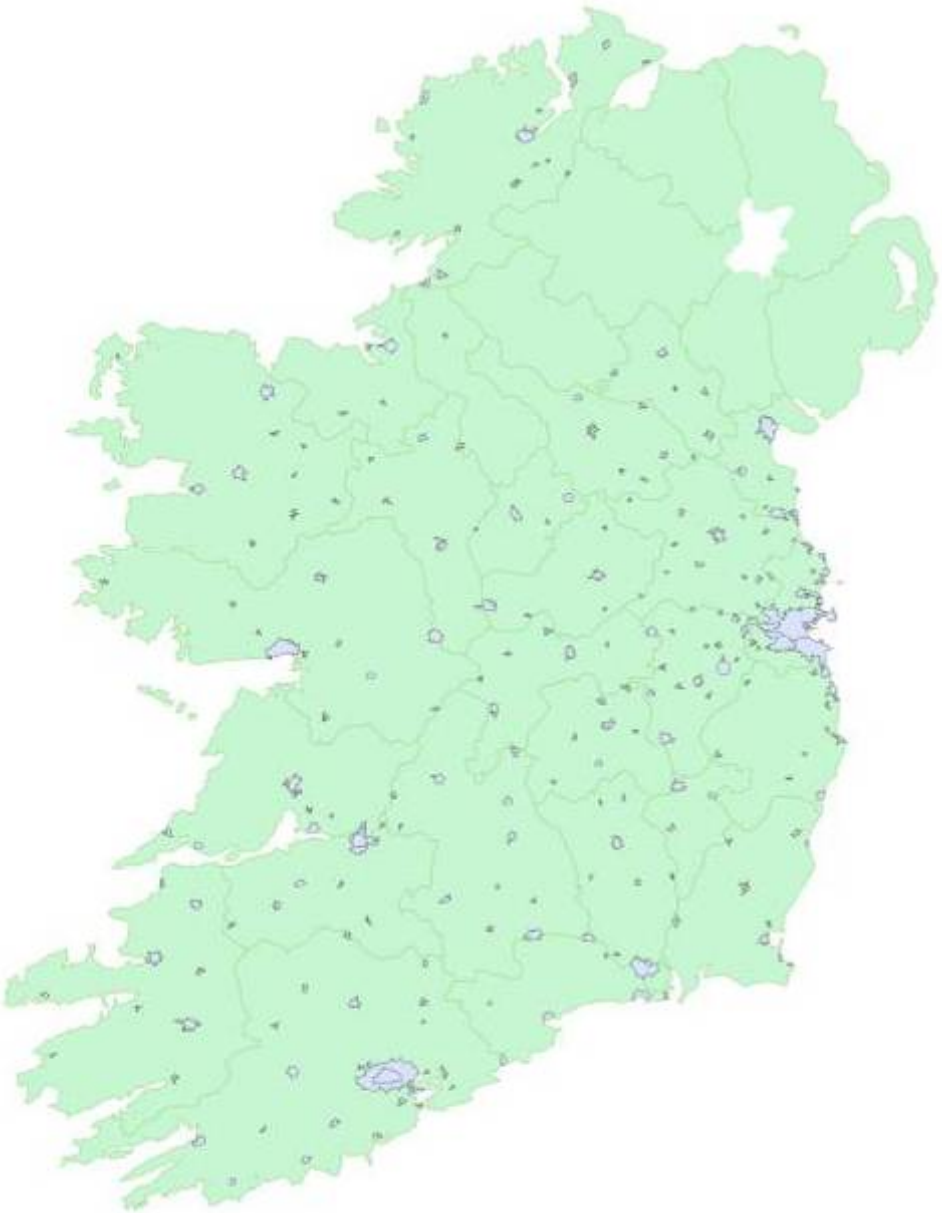


Note: The counties of Meath, Kildare and Wicklow together with Dublin comprise the Greater Dublin Area (GDA). This map also shows the next band of counties contiguous to the GDA which are to some extent within Dublin’s sphere of influence. They include Louth, Cavan, Westmeath, Offaly, Laois, Carlow and Wexford.

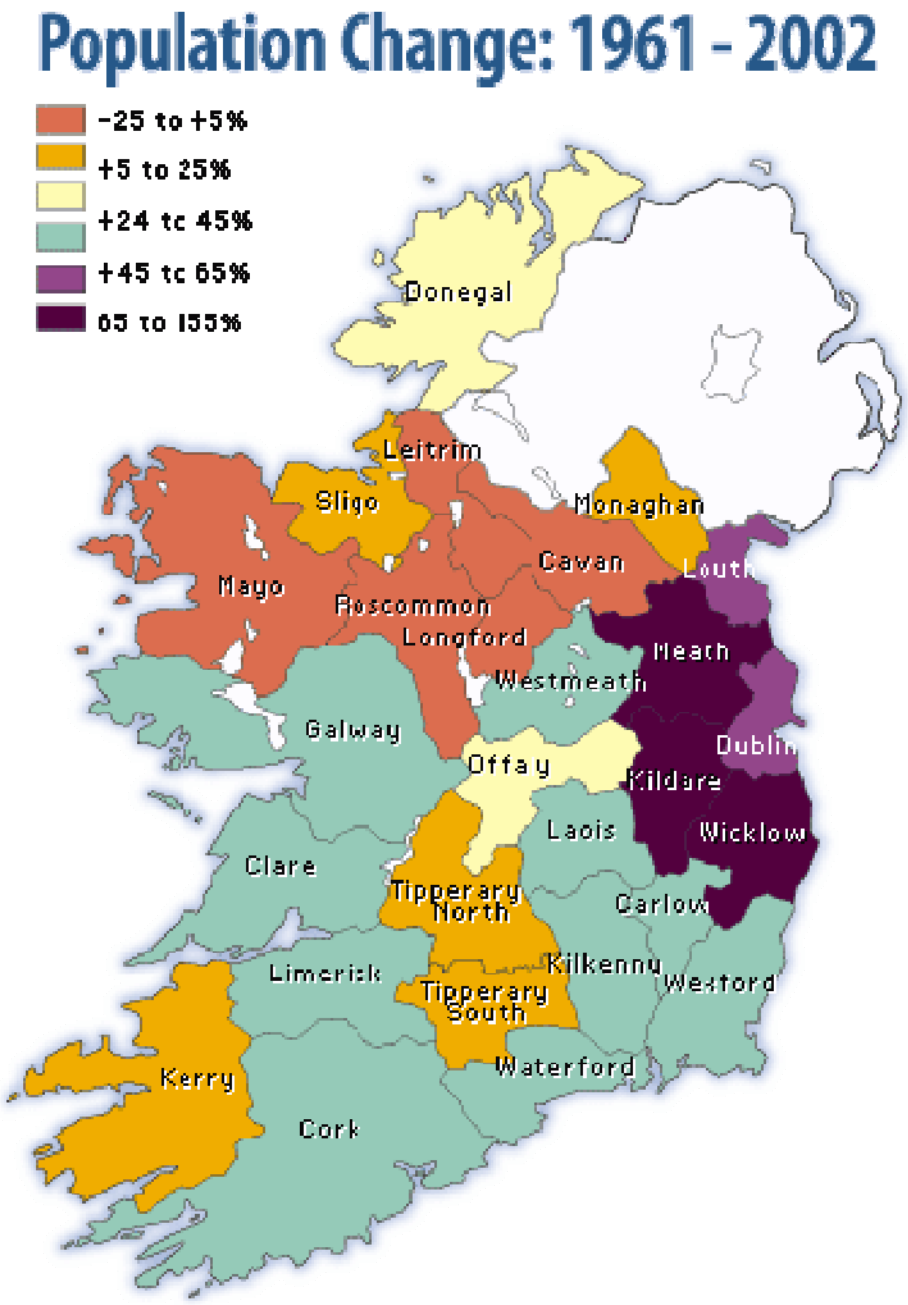
Map 4: Showing Belfast and Derry in relation to the two administrations of Ireland

Note: The locations of Belfast and Derry are shown indicatively rather than in detailed surface area composition as in the cases of Republic of Ireland settlements.

Map 5: Showing the spatial spread of all towns (> 1,500 population)

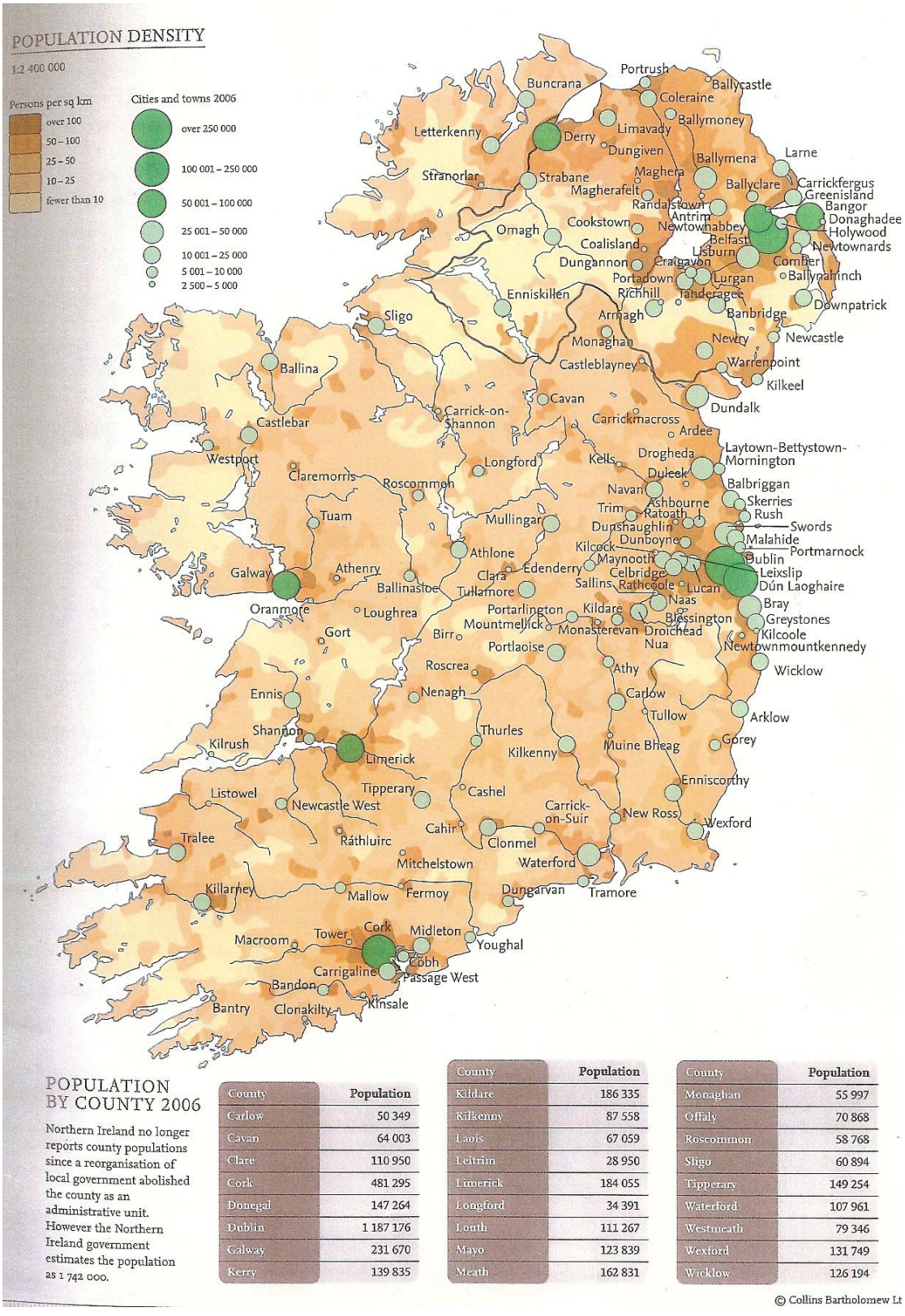


Map 6: County Population Change: 1961 - 2002



Source: Central Statistics Office

Map 7: Population Density Map based on April 2006 Census



POPULATION BY COUNTY 2006

Northern Ireland no longer reports county populations since a reorganisation of local government abolished the county as an administrative unit. However the Northern Ireland government estimates the population as 1 742 000.

County	Population
Carlow	50 349
Cavan	64 003
Clare	110 950
Cork	481 295
Donegal	147 264
Dublin	1 187 176
Galway	231 670
Kerry	139 835

County	Population
Kildare	186 335
Kilkenny	87 558
Laois	67 059
Leitrim	28 950
Limerick	184 055
Longford	34 391
Louth	111 267
Mayo	123 839
Meath	162 831

County	Population
Monaghan	55 997
Offaly	70 868
Roscommon	58 768
Sligo	60 894
Tipperary	149 254
Waterford	107 961
Westmeath	79 346
Wexford	131 749
Wicklow	126 194

APPENDICES

Appendix 1 - Citistate Definition

Citistate Defined: as sourced from http://citistates.com/whatis/

Citistate: Detailed historical and lexicographic context as sourced from http://citistates.com/whatis/

Hist. Similar to city states of antiquity (e.g. Athens, Rome, Carthage) or medieval times (e.g. the Hanseatic League), except that modern citistates engage in instant electronic communication and capital transfer, and are the chief recipients of world population growth.

The world's lead citistates are its greatest metropolises — New York, Tokyo, Paris, Hong Kong, Los Angeles and their global 'command and control' competitors, spread from Chicago to Singapore. But every metro area that's set apart geographically — a Houston, a Denver, a Burlington, Vermont or Boise, Idaho — qualifies as a citistate too.

Here's a definition for the lexicographers — a nomination for 21st century dictionaries: Citi•state — n. — A region consisting of one or more historic central cities surrounded by cities and towns which have a shared identification, function as a single zone for trade, commerce and communication, and are characterized by social, economic and environmental interdependence.

Hist. Similar to city states of antiquity (e.g. Athens, Rome, Carthage) or medieval times (e.g. the Hanseatic League), except that modern citistates engage in instant electronic communication and capital transfer, and are the chief recipients of world population growth.

Citistates would have made little sense under the old paradigm of American thinking at federal, state, local. But they emerge as the centrepiece of a new paradigm at global, regional, and neighbourhood. Citistates become the focus of how our world is now organizing itself. As economic actors, major U.S. citistates compete in size with major world nations. In gross product, the New York region ranks 13th among the world's top economies, just ahead of Australia, Argentina and Russia. The Los Angeles citistate is bigger than Korea, Chicago greater than Taiwan or Switzerland, Washington ahead of Hong Kong, while Minneapolis-St. Paul exceeds Israel. And according to figures

compiled by Standard & Poor's DRI division for the US Conference of Mayors and National Association of Counties, the US's 314 metro regions are clearly the economic drivers, providing 84 percent of new jobs, 95 percent of high-tech jobs, 88 percent of the country's income.

Citistates' importance was enlarged through the 1990s by the rapid flowering of the Internet and the digital revolution. Both have accelerated economic expansion, triggering more global commerce. The challenge of the 21st century is to harness such forces, and civic will, for strategic regional planning. Because to compete in the emerging global economy, citistates have no choice: they must mobilize all their skills to protect their centre cities, grow smarter, protect their air and water, achieve more social equity, and train their workforce to excel in an increasingly competitive world marketplace.

Appendix 2: Economics and Geography: How Krugman contributes to NEG and to the understanding of agglomeration

Brakman and Garretsen (2009) summarise the literature comprising the three stages of Krugman's 2008 Nobel Prize-winning research which copper-fastens spatial economics, core-periphery geography and urban agglomeration. His trinity of research papers on increasing returns, transport costs and factor mobility commences with a paper on *Increasing Returns and Intra-Industry Trade* (1979).

This eschewal of the conventional Heckscher-Ohlin and Ricardian models is replaced by a focus on the empirical research after Gruber & Lloyd (1975) which shows a predominance of intra-industry trade between developed countries. This is exemplified by the role of increasing returns to scale. Krugman uses a simplified Dixit & Stiglitz (1977) model to explain monopolistic competition, a benchmark in the field of market international trade. In this, the flexibility of international demand, supply under imperfect competition, market equilibrium and international trade all result in the emergence of the modern supply-chain effect of FDI. However, at this stage there is no reference or emphasis placed on physical location.

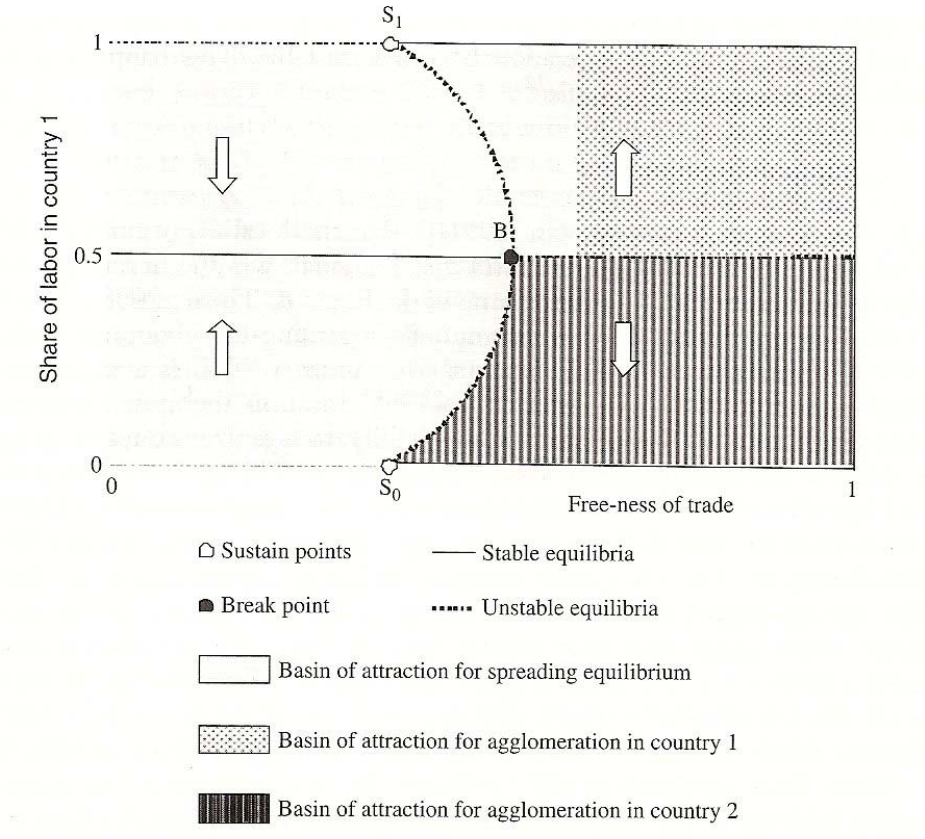
Stage two comprises the publication of Krugman's 1980 paper on *Increasing Returns and Transport Costs.* It commences by introducing these spatially-related costs, thereby simplifying the demand structure. He demonstrates how the introduction of a 'second location' serves to simulate international trade, thereby boosting higher consumption. Increased economies of scale and sensitivity in transport costs influence the location of production to where it is enhanced. This is the 'home market effect'. In turn, this leads to location preference. At this point the analysis is assisted by a Cobb-Douglas utility function, resulting in a constant elasticity of substitution. This second paper concludes that agglomeration is evident with larger market influencing higher wages.

Krugman's stage three (1991) paper deals with *Transport Costs and Interregional Labour Mobility.* This is where location choice minimises transportation costs. The author was influenced by Michael Porter's *Competitive Advantage of Nations* (1989). In constructing a two-region location model, he excludes consideration of the assumption of interregional immobility. This facilitates a general equilibrium model of location choice, determining the quantum of both firms and employment. Significantly, this results in agglomeration being

present in the 'home' region whilst also having a safety valve. That is, by presenting a location choice in the 'periphery' region to avoid the stiffer costs of competition in the 'home' region. This third paper also assists in clarifying the relative importance of Krugman's model such as the *value* of transport costs, the *conflict* between 'agglomeration' forces including price index and home market effects as against 'spread' forces such as the competition effect (*vide* Brakman and Garretsen, 2009).

The following Figure 1 shows Krugman's presentation of the outcome; the directional pressures of the forces of agglomeration for either country or region, thereby favouring the core and periphery region (or country), by way of a tomahawk bifurcation model. In this early instance, free-ness of trade is measured on the 'X' axis and share of labour (in country 1) is scaled on the 'Y' axis, both from zero to one.

Appendix 2, Figure 1: The Tomahawk Bifurcation, from Krugman (1991) model



Source: Brakman and Garretsen (2009)

As identified in this diagram, the 'break' and 'sustain' points and their inter-relationship, are described in Fujita, Krugman and Venables (1991: 41) *as two critical points in the balance between centripetal and centrifugal forces.* Importantly, for tomahawk-type bifurcations, as per the base-multiplier model, the authors suggest that *when the economy is a tomahawk, it takes stronger centripetal forces to break a symmetric equilibrium than to sustain an asymmetric one: The sustain point comes before the break point*. When that occurs, agglomeration is reinforced. On the other hand, high-rising transport costs results in an unstable agglomeration.

In summary, the model confirms that agglomeration in the larger market is stimulated by price, otherwise described as economic competitiveness. Fewer varieties need to be imported and this saves on transport costs. Likewise, agglomeration benefits from the enhanced home-market demand. The spread effect on the other hand is influenced by the competition resulting from higher numbers of firms and workers in the peripheral region

Accordingly, these contra-veiling forces are determined by scale, and ultimately by demographics. As in the case of the Von Thunen model, although some 165 years later, Krugman's model, in substituting international trade for agricultural, produces a similar application to a geographical environment of homogenised space, as is described in Brakman and Garretsen (2009). Having defined 'urban agglomeration' at the commencement of this chapter's 'Key Concepts', it is now instructive to consider Fujita, Krugman and Venables (1991) summation of the conflicting forces for and against 'agglomeration' and 'spread', thus:

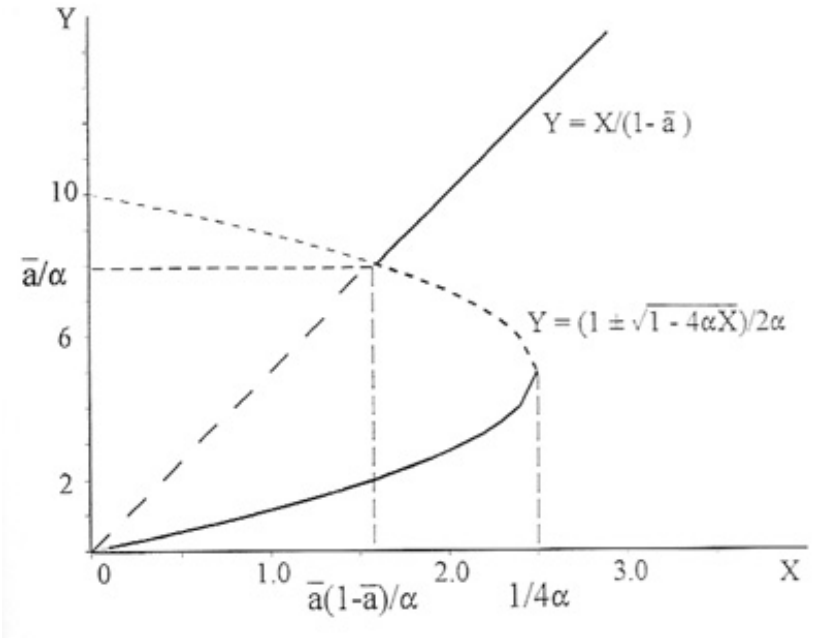
> *…two simple ideas, the first idea is that, in a world where increasing returns and transport costs are both important, forward and backward linkages can create a circular logic of agglomeration. That is, other things being the same, producers want to locate close to their suppliers and to their customers – which means that they want to locate close to each other. The second idea is that the immobility of some resources – land certainly, and in many cases labour – acts as a centrifugal force that opposes the centripetal force of agglomeration. And the tension between these centrifugal and centripetal forces shapes the evolution of the economy's spatial structure (ibid).*

Bifurcations commences the examination of a city or a regional economy by taking the traditional regional science model of Pred (1966), in dividing its economy into 'basic'

external-demand exports or ‘non-basic’ internal-to- the-region activity, *via* the classic base-multiplier analysis. Fujita, *et al.* (ibid) explain that in expanding th*e* ‘home market effect’, *it becomes profitable to produce a wide range of goods and services locally.* Unlike Pred (1966) and others, who had not developed this extension to the base multiplier model idea, Fujita, et al. formulated this extension as *an Equilibria in the Base Multiplier*, as shown in the following figure.

Appendix 2, Figure 2: Equilibria in the Base Multiplier, after Fujita et al. (2001)

Antecedents II: Regional Science



Note: In this model the X Axis represents the size of the regional economy and the Y axis is the base multiplier**.**

Fugita, Krugman and Venables (2001: 31) explain that this base-multiplier approach provides four insights, as follows:

1. *The interaction between economics of scale and endogenous market size can lead to a cumulative process of agglomeration.*
2. *It is important to study not only static equilibria but also, at least in a rudimentary way, dynamics, because dynamics play a crucial simplifying role, limiting the number of possible outcomes.*
3. *The dynamics of economics in which scale economics and market size interact typically involve the possibility of discontinuous change: A cumulative process begins when underlying parameters cross some critical value.*
4. *Finally, and more subtly, the critical value for change in one direction is usually not the same as the critical value for change in the other; for example, in figure 3.1, the regional economy will not 'explode' until X > 2.5, but it will not 'implode' unless X < 1.6.* [i.e. in Appendix 2, Figure 2]

Appendix 3: The NSS: Eight Key Concepts of Balanced Regional Development

The eight Key Concepts of the National Spatial Strategy (2002) are:

- The key concepts (of the NSS) are potential, critical mass, gateways, hubs, complementary roles and linkages.
- Potential is the capacity that an area possesses, or could in future possess, for development, arising from its endowment of natural resources, population, labour, its economic and social capital, infrastructure and its location relative to markets.
- Critical mass relates to size and concentration of population that enables a range of services and facilities to be supported. This in turn can attract and support higher levels of economic activity and improved quality of life.
- Gateways have a strategic location, nationally and relative to their surrounding areas, and provide national scale social, economic infrastructure and support services. Further development of the five existing gateways at Dublin, Cork, Limerick/ Shannon, Galway and Waterford is a key component of the NSS.
- In addition, a small number of other large towns, which have the potential capacity to become gateways and lead development in their regions, will play a key role in achieving a more balanced role in regional development.
- Hubs: A number of towns will act as hubs, supporting the national and international role of the gateways and in turn energising smaller towns and rural areas within their sphere of influence.
- Complementary roles for other towns, villages and rural areas; various medium-sized towns in each region will act as 'local capitals' providing a range of services and opportunities for employment. Within the spatial framework provided by the NSS, rural potential will draw upon local economic strengths, supported by a stronger structure of smaller towns and villages as a focus for economic and social activity and residential development.
- Linkages in terms of good transport, communications and energy networks are vitally important to enable places and areas to play to their strengths.

Source: The National Spatial Strategy (2002-2020: 12)

Appendix 4: The Regional Planning Guidelines for the Greater Dublin Area. (RPGGDA)

The Five Issues and Six Goals of the RPGGDA are:

Issues:

- Provision of Accommodation in particular affordable accommodation in appropriate locations in the Metropolitan Area and in the Hinterland Area
- Transportation, in particular public transportation
- Community support, enlivenment and quality of life in both urban and rural communities
- Provision of civil infrastructure prior to building houses including community centres, arts centres, public swimming pool complexes, playground, skateboard parks
- Protection of the environment and eco-systems

Goals:

- A robust strategic framework that clearly articulates the objectives of the NSS
- A strategy that creates a sustainable attractive, high quality, accessible, cost effective, properly functioning region in its physical, economic and cultural dimension
- Policies, that strengthen the economic competitiveness of the GDA
- The strategy will promote sustainable policies that meet with the requirements of European Directives
- Plan and provide for sustainable infrastructure corridors
- Strengthen and enhance global linkages

That central issue was raised in the GDA 'Regional Guidelines Review', 2003 in the form of a philosophical question, posed at the bottom of page 11 of that Issues Paper: *Should the region evolve towards the vision expressed in the National Spatial Strategy or should market forces and laissez faire prevail?*[45]

The NSS (2002: 78) notes: *Enhancing the competitiveness of the Greater Dublin Area (GDA), so that it continues to perform at the international level as a driver of national development, means physically consolidating the growth of the metropolitan area i.e. Dublin City and suburbs. At the same time, development in the hinterland of the metropolitan area is to be concentrated in strategically placed, strong and dynamic urban centres i.e. the 'Primary Development Centres' identified in the Strategic Planning Guidelines. These development centres have a unique role in Irish terms, given the scale of the Dublin City region and the need for internal balance between the city and its surrounding counties.* [46]

Prompting this question is the fact that since the Strategic Planning Guidelines-established 1996 demographic baseline, shown in the Table 1 'Issues Paper' data for that year, the growth that has taken place over the ten years to the 2006 census is *significantly different to the pattern recommended in the guidelines* (*op. cit.*, p. 11). Specifically…*The emerging pattern is of faster than anticipated growth in parts of the Hinterland Area and less development* [as has occurred] *in parts of the Metropolitan Area (ibid.).*

[45] The use of the term *laissez faire* in this question may of course be co-incidental but it is noted with interest that McDonald, F, (2000: 213) which uses this term in describing this *approach to the development of Greater Dublin (that) will inevitably turn it into Brian Hughes's envisioned 'city-state of the 21st century,' with more than half of the population living there by 2047, if not sooner* (*op. cit.* Hughes, B, 1999) *Planning for Dublin in 21st Century Ireland,* Society of Chartered Surveyors, Dublin.

[46] The Primary Development Centres are: Drogheda, Navan, Naas and Wicklow: *vide* NSS (2002: 79).

Appendix 5: Literature References that are at variance to the National Spatial Strategy

Within this literature review it is instructive to note the growing list of authors and the reasons they adduce to cast doubts as to the veracity and basis of the NSS document, and by extension to its RPG. In addition to this research, the sources and emphasis are noted in parenthesis:

1. O'Leary, E. (2003) (Ed.), *Irish Regional Development: A New Agenda,* The Liffey Press. [BRD: Should be replaced: See: 6.5 Synthesis, p. 486.]

2. Clinch, P., Convery, F., Walsh, B. (2002), *After the Celtic Tiger – Challenges Ahead,* O'Brien Press, Dublin. ["The Faustian Bargain". NSS criticism: See: 6.2 Pointers, p. 470.]

3. McWilliams, D. (2005), *The Pope's Children – Ireland's New Elite*, Gill & Macmillan. ["Dublin and big cities in all countries are the dynamos of the national economy." McWilliams, D. (2006).]

4. O'Toole, T. (2005). In the *Irish Times* asks [should the RPGs be 'developmental' or 'transformative'? What best creates a sustainable future? [He concludes that regions that naturally fit together e.g. Dublin and the Mid-East, *will develop co-operative policies, autonomously, and in turn, Pareto-like, will move away from the 'winners and losers' mindset that currently overshadows all of our current thinking at regional level.*]

5. Bartley, B. and Kitchin, R, (eds) (2007). *Understanding Contemporary Ireland*, Pluto Press, London, Dublin and Ann Arbor. [*This conflict between industrial policy and regional policy has been brought about because of the country's particular urban structure: solving it represents one of the most difficult dilemmas confronting policy makers at national level.* p. 70]

6. Thornhill, D. (2009). *Our Cities: Drivers of National Competitiveness,* Forfás – National Competitiveness Council, Dublin. [Replacing BRD with national

competitiveness and maximising the inherent growth potential of each city rather than redirecting economic growth away from Dublin]

7. Yarwood, J. (ed) (2006). *The Dublin-Belfast Development Corridor: Ireland's Mega-City Region*, Surrey, UK: Ashgate. [centripetal agglomeration will result from concentration of population within the East and North-East]

8. Zoellick, R.B. (2009). *Reshaping Economic Geography – World Development Report*, The World Bank - The International Bank for Reconstruction and Development. Washington, DC. [Density and distance reduction replacing BRD]

9. NESC 117 (2008) The Irish Economy in the Early 21st Century [to consider replacing the traditional *distributive* approach to regional development by viewing it as *constitutive* of a successful –competitive- national economy and the role of Agglomeration Economics as a key concept in understanding regional development.

10. Futures Academy (2008). *Twice the Size: Imagineering the Future of Irish Gateways*, The Futures Academy, Faculty of the Built Environment, Dublin Institute of Technology

Focusing on the limitations of the NSS, the attached article hereunder, in Figure 1, dated February 6th 2008 in the Sligo Champion: *Scrap spatial strategy plan under attack*, is a criticism from Ireland's Independent MEP Marian Harkin of the Futures Academy's (2008) call to scrap the NSS. She cited the European Commission's Fourth Cohesion Report, confirming the EU approach to fostering regional development by way of convergence. The Harkin criticism appears as a good example of the call to maintain the traditional 'distributive' approach as opposed to the need for competitiveness. In turn, this serves to highlight the contrast between the EU approach as contrasted with that of the USA and World Bank's advocacy towards a strategy for centripetal agglomeration, as discussed, p. 111 herein.

Appendix 6: Opponents to Twice the Size

Appendix 6, Figure 1**:** Scrap spatial strategy plan under attack

Publication: Sligo Champion
Date: Wednesday, February 6, 2008
Page: 13
Extract: 1 of 1
Circulation: 12,574
Author:
Headline: Scrap spatial strategy plan under attack

Scrap spatial strategy plan under attack

'IT IS vitally important that the recent proposal put forward by the Futures Academy, at Dublin Institute of Technology on scrapping the Spatial Strategy be immediately stopped in its tracks. The proposal runs counter to the objective of 'balanced regional development' and makes the case for a greater concentration of resources along the East coast".

This was stated by Independent MEP Marian Harkin when she responded to the proposals contained in the recent DIT Report.

She said:- "I find this proposal totally at odds with thinking in the European Parliament. The Fourth Cohesion Report produced by the European Commission has as its title 'Growing Regions Growing Europe'. The title in itself clearly illustrates the thinking at EU level. The Regional Development Commissioner Danuta Hübner says in the foreword 'with this Report the Commission is launching the debate on how in the face of the forthcoming social and economic changes Cohesion Policy can best continue to foster regional development and convergence...Europe cannot grow without strong and growing regions'. I would like to borrow the Commissioner's words and say to those who propose scrapping the Spatial Strategy, 'Ireland cannot grow without strong and growing regions'.

'Furthermore this proposal totally ignores the evidence, compiled by the Western Development Commission which highlights the fact that over 41% of people living in the East would like to move West. What this 'Think Tank' should be proposing is the building up of the infrastructure in the West alongside the provision of adequate services both economic and social so that those who want to remain in the West and those who wish to move West can have the opportunity to do so." Marian Harkin MEP concluded.

Appendix Item 7: Case Study One – Settlement Distance from Dublin and Population Growth

One of the objectives of this evidence-based analysis is to compare settlement growth rates with distance along these economic transportation corridors. Four different directions are reflected in the chosen counties and their principal routes are shown. Carlow and Kilkenny are combined because of their limited choice of comparable large towns. The methodology identifies the principal settlements of selection transportation corridors and in comparison the population growth of 'nearer' towns and 'further' towns. On average, the more distant towns are half as far away again from Dublin as are the more proximate ones.

Appendix 7, Table 1: Radial Economic Corridors and their Population to Distance Analysis: Same County Town Population Analysis (1986-2006) – Major Radial Corridors:

	1986 Population	2006 Population	% Growth in Population	Distance from Dublin (kms)	Distance from Dublin (miles)
M1 - County Louth Towns					
Drogheda	24,681	35,090	42.17	51	(32)
Dundalk	30,608	35,085	14.63	85	(53)
M4 - County Westmeath Towns					
Mullingar	12,127	18,416	51.86	80	(50)
Athlone	15,571	17,544	12.67	126	(78)
N9 – Counties Carlow/Kilkenny					
Carlow	13,816	20,724	50.00	90	(56)
Kilkenny	17,537	22,179	26.47	129	(80)
M11 - County Wexford Towns					
Gorey	3,884	7,193	85.20	77	(48)
Enniscorthy	7,753	9,538	23.02	108	(67)

Source: CSO 1986 and 2006 Vol.1 + AA Handbook. 1 Mile = 1.6093 Km. Analysis: Thesis author

The comparative analysis for both categories of towns, tabulates aggregate populations, average growth rates and distances, are shown thus:

Appendix 7, Table 2: Sectoral Town Population and Distance Analysis:

'Nearer' Towns	**1986**	**2006**	**Miles**	**'Further' Towns**	**1986**	**2006**	**Miles**
Drogheda	24,681	35,090	32	Dundalk	30,608	35,085	53
Mullingar	12,127	18,416	50	Athlone	15,571	17,544	78
Carlow	13,816	20,724	56	Kilkenny	17,537	22,179	80
Gorey	3,884	7,193	48	Enniscorthy	7,753	9,538	67
Totals:	54,508	81,423	46.5 (avge.)	Totals:	71,469	84,346	69.5 (avge.)

Source: CSO 1986 and 2006 Censuses, Vols. 1 and Ireland Road Mileage data. Analysis: Thesis author

From this analysis of population-growth to distance over twenty years, it confirms that the aggregate population of the nearer towns to Dublin grew at 2.74-times the rate of the further towns, i.e. 49.38% compared with only 18.02% between 1986 and 2006. In terms of mileage distances from Dublin, it is noted that the 'further' towns, in aggregate, are 1.49 times further away from Dublin city centre. In 1986-2006, State population grew at 19.75 %, which was moderately ahead of the average 18.02% growth rate over that period for the 'further' towns.

The conclusion from this analysis is that these towns have only recently come within Dublin's 'sphere of influence'. Such finding concurs with that of Williams, Hughes and Shiels (2006: 13) based on the Urban Institute & GPEP, UCD (2005) Map of Electoral Districts, which showed an outer radius of 100 kilometres or 62 miles for Dublin's Functional Urban Region (FUR). The results from these findings show that Dublin's FUR boundary is expanding at a rate of about 1.5 km. per annum.

The above empirical analysis, when considered with these 'observations' are instructive, both from a public strategic policy and the spatial planning perspectives. They are of particular relevance to public policy implementation of the NSS (*op. cit.* p. 38), especially with regard to its major quest: to achieve the key objective of 'consolidation'. Clearly, these growth findings for major towns serve as a comparative 'weather vane' of regional growth. When compared with the modest growth of Dublin city, i.e. 13.55% over that 20-year period 1986-2006, this analysis also serves to gauge the comparative spill-over resulting from the city's urban agglomerative effect.

The second Case Study for quantitative investigation commences with a case study of Dublin and Cork cities: their long and medium-term historic comparisons

Appendix 8: Case Study Two: Largest Settlements - Dublin and Cork

This Case Study compares demographically Dublin with the State's second settlement, Cork. It analyses their respective contiguous and hinterland population performances over various time periods. In doing so, it confirms the growth benefit of UA that appears to be confined to Dublin based on comparative population performance, especially since 1960.

This investigation examines the demographics of urban agglomeration (UA) in Ireland. This compares demographic time analyses for both medium – 20 year and long term – 80 year timeframes. A series of tests are designed to show comparative outcomes for Dublin and Cork settlements together with their respective hinterlands. As UA is attributable to city and city regions as distinct from towns, the long-term analysis compares and contrasts the respective population growths for the 80-year period 1926-2006. This is followed by medium-term investigation 1986-2006 which examines the hinterland areas as distinct from the contiguous built-up city areas. This analysis also differentiates between the aggregate towns and their surrounding populations. The study employs four tests followed by an investigation of respective population densities for Dublin and Cork.

The first task is to set out the research findings as practical demographic 'tests' of agglomeration, for individual State censuses since the first census of 1926. This concerns the contiguous built-up city populations for both settlements, thus:

Appendix 8, Table 1: Comparison of Contiguous Built-up Dublin and Cork

Census Year	Dublin	Cork	Cork as % of Dublin
1926	418,981	78,490	18.73
1936	507,888	93,322	18.37
1946	550,725	89,877	16.32
1951	634,473	112,009	17.65
1956	649,338	114,428	17.62
1961	665,556	115,102	17.29
1966	736,681	125,824	17.08
1971	801,298	135,456	16.91
1979	900,884	150,059	16.66
1981	915,115	149,792	16.37
1986	921,081	174,109	18.90
1991	929,090	174,400	18.77
1996	952,692	179,954	18.89
2002	1,004,614	186,239	18.54
2006	1,045,769	190,384	18.21

Source: Author's analysis of Censuses of Population, Vols. 1. (1926 to 2006).

Table 1 confirms that long-term proportionality has been maintained. Over this eighty-year period, Cork population at 17.6% that of Dublin, had a variance of plus or minus 1.3%. Apart from the obvious fact that built-up contiguous Cork has made little progress in narrowing the percentage size-gap with that of Dublin, over time, this outcome means - in absolute terms - that contiguous Dublin's population size difference has grown by over *half a million* people **more so** than that of Cork. It confirms Professor Ratcliffe's 2004 directive, for city comparison and *the need to recognise scale-size differentiation rather than just focusing on the relatively modest decline in percentage terms*, in this instance from 18.73% in 1926 to 18.21% in 2006.

This population size difference is summarised thus:

Test Outcome 1: Contiguous Dublin and Cork Size Difference 1926-2006

Year	Contiguous Dublin		Contiguous Cork	Size Difference
2006	1,045,769	-	190,384	= 855,385
1926	418,981	-	78,490	= 340,491
			80-year size divergence	= 514,894

Source: Author's analysis of Censuses of Population, Vols. 1. 1926-2006.

A second test for this longer period is to compare respective hinterland population changes. So as to maintain consistency in using a comparative size of surface area over that time period, it was decided to measure the GDA with Cork County, exclusive of their respective built-up city areas. Both surface areas are quite similar. Excluding city

areas, Cork's hinterland extends to 7,373.85 sq. km. compared with the 6,707.84 sq. km. area of the GDA.

Cork exceeds the GDA Hinterland surface area by just 9.33%.[47] This test is used to quantify and compare the UA effect. It involves the isolation of the respective hinterland populations, i.e. by deducting the built-up contiguous populations from their respective GDA/ Cork county aggregate at every census date. These data are set out in Table 3.6, thus:

Appendix 8, Table 2: GDA and Cork City and County Comparison

	GDA	less Contiguous Dublin City	= Dublin's Hinterland	Cork County (entirety)	less Contiguous Cork City	= Cork's Hinterland
Year						
1926	684,242	418,981	265,261	365,747	78,490	287,257
1936	764,791	507,888	256,903	355,957	93,322	262,635
1946	827,725	550,725	277,000	343,668	89,877	253,791
1951	888,386	634,473	253,913	341,284	112,009	229,275
1956	898,364	649,338	249,026	336,663	114,428	222,235
1961	906,347	665,556	240,791	330,443	115,102	215,341
1966	989,202	736,681	252,521	339,703	125,824	213,879
1971	1,062,220	801,298	260,922	352,883	135,456	217,427
1979	1,255,533	900,884	354,649	396,118	150,059	246,059
1981	1,290,154	915,115	375,039	402,465	149,792	252,673
1986	1,336,119	921,081	415,038	412,735	174,109	238,626
1991	1,350,595	929,090	421,505	410,369	174,400	235,969
1996	1,405,671	952,692	452,979	420,510	179,954	240,556
2002	1,535,446	1,004,614	530,832	447,829	186,239	261,590
2006	1,662,536	1,045,769	616,767	481,295	190,384	290,911

Source: Author's analysis of Census of Population, Vols. 1. The figures for 2006 are author's estimates based on examination of the Electoral District outturns from the 2006 Census Preliminary Report, Table 4 data.

Since the latter half of the 20th century in the USA and over the last quarter thereof in Europe, 'edge city' and polycentric/ centrifugal-type morphological development has resulted in hinterland urban centre-growth. Progressively, this has complemented core area and contiguous built-up city growth. Hinterland growth occurs both by way of town and surrounding peri-urban growth. Accordingly, for the Republic of Ireland another analysis of UA growth is tested by comparing Dublin with Cork hinterlands

[47] The basis for author's computation of the respective hinterland surface areas is to add to the official City Council areas a proportion of Cork Rural district (10%) and to Dublin City for consistency, a portion of its former County Council area (20%) – noting that the GDA also includes all of Kildare, Meath and Wicklow. Both contiguous built-up settlements are then deducted from total Cork plus County and from total GDA areas, respectively.

over the same 80-year time-span. The analysis from Table 2 data is summarised as follows:

Test Outcome 2: GDA and Cork Hinterlands – Aggregate Comparison: 1926-2006

Year	Hinterland Dublin	-	Hinterland Cork	=	Size Difference
2006	616,767	-	290,911	=	325,856
1926	265,261	-	287,257	=	-21,996
			80-year size divergence	=	347,852

Dublin's SoI, evidenced in longer commuting, has progressively over spilt across the GDA into outer Leinster and south-east Ulster counties. Furthermore, this 2006 hinterland figure of 616,767 for the GDA understates the extent of this SoI. It discounts population growth spill over into outer Leinster and south-east Ulster counties. This is estimated to be about 15% of the 76,000 figure for aggregate population deflection from Dublin (Williams, Hughes and Shiels, 2007). Likewise, the settlement analysis in Appendix 5 tables identifies specific RoS towns that are within Dublin's SoI. It confirms higher rates of population growth for such towns when compared with the majority of RoS towns that are outside of Dublin's SoI. In summary, Tests 1 and 2 combined show a long term divergence of 862,746 as between Dublin and Cork populations, *exclusive* of overspill from GDA into outer Leinster and south-east Ulster counties. There is assumed to be no parallel overspill from Cork into other Munster counties.

Although this *extra*-GDA population is effectively within Dublin's SoI, for consistency, the subject analysis is confined to the two defined geographical areas already described. The significance of the aforementioned aggregate divergences, amounting to 862,746, can be appreciated in that this represents 68.05% of overall State population growth of 1,267,856 for 1926-2006.

The following Tests 3 and 4 compare Dublin with Cork for hinterland town-size growth comparisons and for their respective rural population growth outcomes over the twenty years 1986-2006. This facilitates the assembly of evidence of comparative demographic agglomerative benefit, pre and post-'Celtic Tiger' for both city areas. Test Outcome 3 sets out these data for all towns of 1,500 or more as of these census dates, thus:

Test Outcome 3: GDA and Cork Towns – Aggregate comparison 1986-2006

Year	GDA Towns Population		Cork Towns Population		Growth Difference
2006	404,278	-	105,302	=	298,976
1986	223,987	-	75,087	=	148,900
20-year growth	180,291	-	30,215	=	150,076
	20-Year Aggregate Divergence:				150,076

Source: CSO 2006 Census, Table 7 and 1986 Census, Table 14 (part).

Over this period, just three additional Cork 'town' settlements emerged whereas over the same period an additional 15 urban settlements of 1,500-plus were created in the GDA. Thus in 2006 there were a total of 49 GDA towns as against 21 for Cork. Morphologically, the GDA is experiencing intensive town growth, especially since 2002, as evidenced by the predominance of Dublin entries in Table B of the CSO Preliminary Report for the 2006 census. There, sixteen of the *top twenty electoral divisions ordered by population change, 2002 to 2006* contributed *inter alia*, to the State's fastest-growing counties of Kildare, Meath and Fingal of recent years.

In 1986-2006, aggregate GDA town population grew by 80.49% or by 3.00% per annum compound. Correspondingly, Cork's towns grew by 32.05%, just 1.32% per annum. GDA aggregate population town growth was nearly six times that of Cork towns 1986-2006. To complete this 20-year comparative analysis of GDA with Cork, the fourth 'test' compares their respective rural population growth performances over the same time period, thus:

Test Outcome 4: GDA and Cork Hinterlands – Aggregate Rural Comparison 1986-2006

Year	GDA Rural Population		Cork Rural Population		Size Difference
2006	213,819	-	185,609	=	28,210
1986	195,496	-	169,128	=	26,368
20-year growth	18,323	-	16,481	=	1,842
	20-Year Aggregate Divergence			=	1,842

Source: CSO 2006 Census, Table 7 and 1986 Census, Table 14 (part).

Over this time span GDA's rural population grew by 18,323 or by 9.37% in contrast with Cork's rural population increase of 16,481, or 9.74%. In the same time period, the State rural population showed a 0.72% decline, reducing from 1,677,643 in 1986 to 1,665,535 in 2006. Accordingly, it can be concluded that urbanisation also influences

the rate of population growth for its surrounding rural areas, although for recent decades in both Dublin and Cork's case their rates of rural population growth was just less than half that of the State's 19.75% overall 1986-2006 population growth performance. Clearly, the above data support the view that spatial planning measures by the respective local authorities to curtail one-off rural housing are being successfully implemented near larger cities. Ongoing anecdotal criticisms of such planning implementation, however, point to a more relaxed stance being taken in rural areas of the State, particularly in areas where urbanisation is weak.[48]

Surmising the outcomes from these four 'tests', it is evident that over both periods of time: the 80 and 20 year comparative time frames, population growth performance for the GDA is superior to that of the Cork area; especially so for their respective towns. Comparing the city growths, there is a slightly better performance for Dublin. Its population grew 2.4960 times over the 80-year time frame as against Cork's 2.4256 times. Thus, Dublin's absolute population, reflective of its scale-size difference with Cork when combined with its much superior town growth performance shows the superior demographic-growth impact of UA. Only their respective rural areas failed to show striking differences – in fact Cork's rural growth was slightly stronger over the 1986-2006 timeframe. Both rural areas enjoy growth at about half the State's overall population growth rate. However this was in contrast to the overall State's rural decline.

Thus, the findings of Alonso (1971) are perhaps even more resonant today as per Figure 2.2. The urban agglomerative effect of city size impacts on its own growth potential in addition to that of its SoI. This model confirms that for population sizes between the Alonso inflection points 'A' and 'D' the benefits of UA outweigh the burdens of congestion, pollution and crime. Whilst specific population thresholds that coincide with these inflection points are debated, empirical researches to-date suggest that for advanced knowledge economies point 'A' has to be at least 200,000 and that 'D' is in or above 2.5 million (Scott, 2001; Balchin et al., 2000; Bergovic, 1991).

Two specific issues tend to complicate this picture. The quantum of infrastructure and the measurement/ interpretation of what constitutes a city and its SoI. Likewise, for

[48] Section 140 motions by public representatives are still receiving adverse publicity, as in the case reported for County Sligo (April 2008).

Ireland, it is the issue of its rural population disposition in combination with both urban/ town performances that reflect the presence or otherwise, of agglomerative conditions. This is very much dependent on the presence of an agglomerating city: a factor that appears to be absent in the RoS area; even in the case of its largest settlement, as the research evidence leading to the test outcomes of this second case study confirms.

These tests outcomes provide consistency of direction in their findings. They quantify the extent of divergence, under different criteria, in using the GDA as a benchmark. This analysis suggests that Cork has not yet reached a settlement-level population at which UA spontaneously takes place. At best, its 2006 census population appears to correspond with Alonso's point 'A'. Nonetheless, it is encouraging to note the *initiation* of its Hinterland population acceleration commencing in 1996, as confirmed in Test Outcome 4.

In the sphere of strategic public policy, the recent publication of the 2007-2013 National Development Plan's thrust, reinforces the conclusion that successive Irish governments have not acknowledge the growth potential its cities. Ireland's (excluding Belfast) absence of small to medium-sized cities, in the 200,000-500,000 population range, bears this out. This defect makes the NSS objective of 'BRD' all the more difficult to achieve, as emphasised in O'Leary (2003). For Cork, it is instructive that no progress in improving its 80-year population proportionality with that of Dublin where, significantly, the capital's SoI towns are making conspicuously stronger progress.

The last element of this case study examines the demographic 'pathology' of Cork County so as to contrast its population growth and density with that of the GDA over the most recent intercensal decade. The commencement point is to examine the entire city and county areas for population growth. Cork's overall growth was just 85.53% that of the State over that period but as the following Table 3 shows, its constituent parts experienced quite different outcomes. For both criteria, i.e. the City Authority and the 10 Outer Rural Areas, their respective performances have been weak with loss of percentage share. In contrast, the Cork Rural Area together with the 6 adjoining Inner Rural areas grew their respective populations and also increased population share. These findings have sustainability implications, not least for increased medium and long-distance commuting.

Appendix 8, Table 3: Cork's Composite Population - Summary: 1996-2006

	Population and % Share in 1996		Change in % Share	Population and % Share in 2006	
City Authority	127,187	30.25	-5.5%	119,418	24.78
Cork Rural Area	87,665	20.85	+4.0%	119,520	24.85
6 Inner Rural Areas	118,917	28.28	+2.6%	148,039	30.78
10 Outer Rural Areas	86,741	20.62	-1.1%	94,318	19.59
Total City + County	**420,510**	**100.00**	**ZERO %**	**481,295**	**100.00**

Source: Author's analysis of CSO data.

Note: In this decade, Cork's aggregate population growth was 14.36% compared with 18.27% for the GDA. Cork's six Inner Rural Areas are: Bandon, Fermoy, Kinsale, Macroom, Mallow and Midleton. These are contiguous to the Cork Rural Area.

The next task, shown in the following two tables, is to assess the same areas of city and county for population density, for Dublin and Cork as empirical evidence for their respective agglomeration.

Appendix 8, Table 4: Cork's Sphere of Influence 2006 Population and Density:

	Population	Density of Area (Sq.Km.)	Pop./ Sq. Km	Growth and %'s (Between 1996 and 2006)	
City Authority	119,418	39.53	3,022	-7,769	-6.11%
Cork Rural District	119,520	665.69	180	+31,855	+36.34%
Inner Rural Areas	148,039	3,201.59	46	+29,122	+24.49%
10 Outer Rural Areas	94,318	3,593.14	26	+7,577	+8.73%
Total City + County	**481,295**	**7,499.95**	**64.17**	**+60,785**	**+14.46%**

Source: Author's analysis of CSO Volume 1, 2006 census, Table 6.

In the following Table 5 these data are then compared with GDA, thus:

Appendix 8, Table 5: Dublin's SoI 2006 Population and Density

	Population	Density of Area (Sq.Km.)	Density of Pop./ Sq. Km	Growth and %'s (Between 1996 and 2006)	
City Authority	506,211	117.58	4,305	+27,822	+5.77%
County areas	680,965	804.69	846	+104,555	+18.14%
Mid-East	475,360	6,064.09	78	+127,953	+36.83%
Rest of Leinster	632,587	12,814.30	49	+113,556	+21.88%

Source: Author's analysis.
Note: The above county areas comprise Dun Laoghaire-Rathdown, South Dublin and Fingal counties.

The latter stage of the analysis is broadened geographically. Rural 'Rest of Leinster' area is ***now*** introduced so as to compare and contrast with the densities of Cork's 10 Outer Rural Areas. The comparison between the State's two largest settlements and their respective spheres of influence populations and densities are summarised, thus:

Appendix 8, Figure 1: Sphere of Influence Density Summary 2006

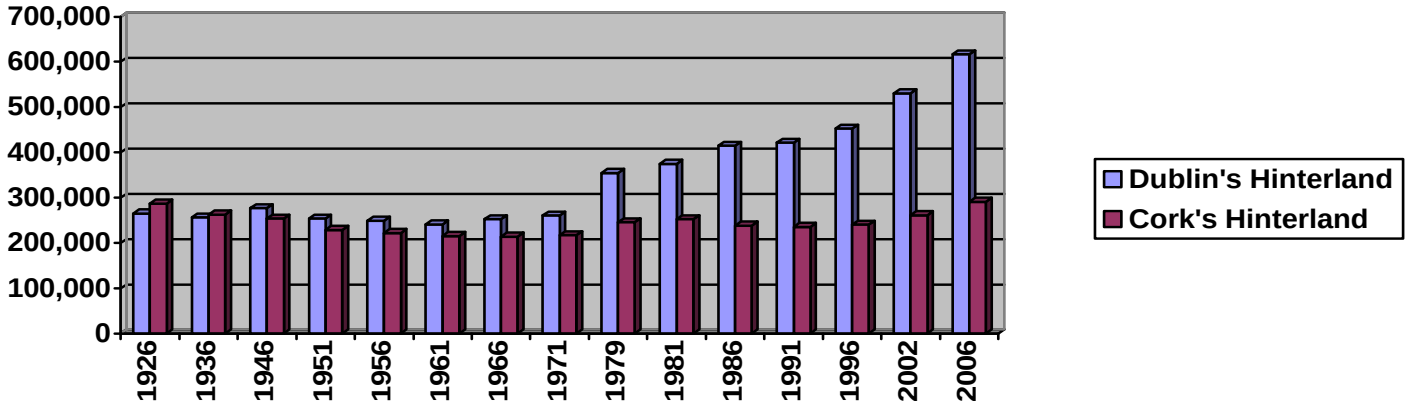
'Region'	Population	Area (Sq km.)	Density	Region	Population	Area (Sq. km.)	Density
Cork City and County	481,295	7,499.95	64.17	GDA	1,662,536	6,986.36	237.97

Source: Author's analysis of CSO Volume 1, 2006 census

These approximately similar geographical surface areas have contrasting population densities: the GDA's density being some 3.71 times that of Cork city plus county. Despite positive population growth the conclusion is that over the longer 80-year timeframe, no progress has been achieved in reducing Dublin's dominant position, population or density-wise.

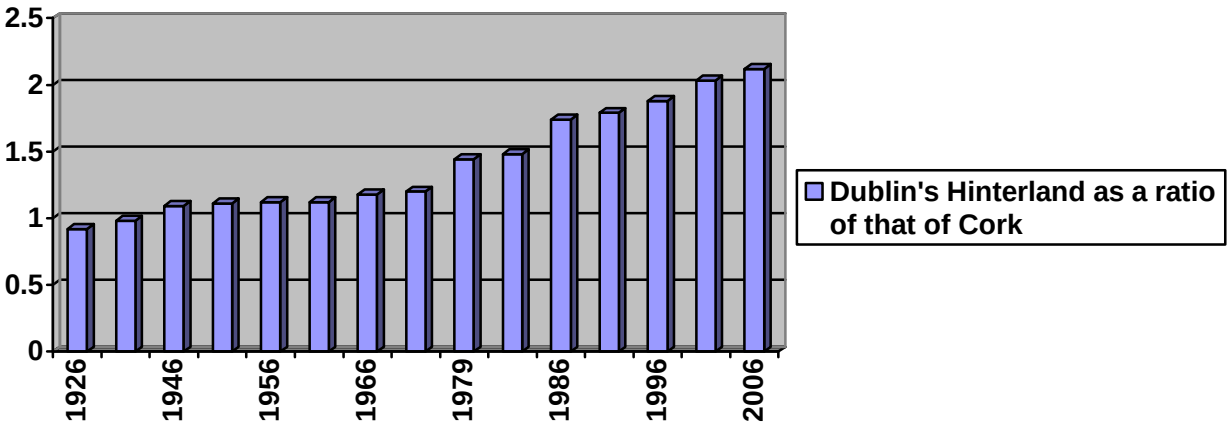
The final analysis compares Dublin's hinterland, expressed as a ratio of Cork's set out in Table Figure 2, thus:

Appendix 8, Figure 2: Dublin's Long Run Hinterland Population Compared With Cork



Source: Author's analysis of CSO Volume 1, 2006 census

Appendix 8, Figure 3: Dublin's Long Run Hinterland Population as a One-to-One Ratio of Cork's Hinterland



Source: Author's analysis of Census of Population, Vols. 1. The figures for 2006 are extracted from the CSO Principal Demographic Results, Table B data. Here, the GDA area is being compared with all of County Cork.

This ratio of population growth, in favour of the GDA hinterland, demonstrates the extent to which Dublin has and continues to agglomerate. This has been independently verified.[49] However, it is instructive to note that significant progress made since 1996 in

[49] Between 1986-2006 the growth in town formation is instructive.. The 14 additional GDA settlements (1,500 population and over) represented an increase of 41.18% in contrast to the 29 new RoS area's increase of 32.95%. The average size of all GDA towns increased by 82.46% compared with the RoS increase of just 32.55% over that period. Accordingly, the GDA towns' population growth was 21.08% as compared with 12.22% for the RoS settlements. State population growth was 19.75%.

the growth of Cork's hinterland in the level of its population expansion would indicate that inflection Point 'A' of Alonso's (1971) Model may have been reached.[50]

In summary, this Case Studies serve to support the trend-direction of the thesis hypothesis on convergence. Dublin remains monocentric and its shorter-distanced SoI town growth is much stronger. Likewise its absolute size differences increases over time when compared with Cork. This still leaves the question as to the time frame for convergence to occur.

[50] From a commercial property perspective, however, in terms of net absorption of office floor space and evidence of end-use demand in Cork, there is ***little*** supporting evidence to confirm that the city's services sector and a presence of significant APS-type employment have yet emerged. Slow apartment take-up in Cork's largest new residential development and the State's tallest occupied structure the Elysian project reinforces this assessment, O'Flynn (2009). Thus further on-the-ground evidence of infrastructural improvements and market-led activity including the completion and occupation of medium and larger projects will have to be demonstrated, in contrast with what is a current rising level of office vacancy in a proliferation of small to medium-size tenancies.

Appendix 9: Testimony to the Oireachtas Joint Committee on Enterprise and Small Business by the former IDA Chief Executive (Dorgan, 2003):

Although such cited examples are always of particular significance to their local economies, the aggregate location-decisions preferences for FDI, particularly of research and development, overseas manufacturing and APS, invariably favour cities and large settlements. This was officially confirmed in the significant testimony to the Oireachtas Joint Committee on Enterprise and Small Business by the former IDA Chief Executive (Dorgan, 2003):

> *Sparsely populated provincial towns will struggle to win 'high-value' multinational investment in the short term because they cannot compete with larger urban centres, both in the Republic and abroad, IDA Ireland chief executive Mr Sean Dorgan told an Oireachtas committee yesterday.*
>
> *He said foreign direct investment was likely to be concentrated on those towns identified as gateways under the National Spatial Strategy as they developed.*
>
> *In a frank assessment of the outlook, Mr Dorgan said it was unrealistic to expect regions disadvantaged by their remoteness to attract significant research and development projects, which will become vital as manufacturing industries abandon the State in favour of low-wage economies in increasing numbers over the coming decade.*
>
> *Because many major global players will locate only in large cities, Dublin is increasingly competing for investment not against other Irish population centres but against European capitals such as Amsterdam and Geneva, Mr Dorgan told the Joint Committee on Enterprise and Small Business.*
>
> *His comments will dishearten the Government, which has prioritised encouraging inward investment to locate outside Dublin, particularly in the BMW region encompassing parts of the west, midlands and north-west.*
>
> *Labour finance spokesman, Mr Brendan Howlin, whose Wexford constituency suffers one of the Republic's highest employment rates, said he was depressed by Mr Dorgan's conclusions.*
>
> *The IDA chief said that the development of regional gateways, as set out in the national spatial strategy, was crucial if areas outside the major population centres were to win substantial projects.*
>
> *It may have been wiser for Government to focus on nurturing gateway towns rather than 'compromising' by concentrating on developing smaller 'hub' centres, he suggested.*
>
> *Focusing exclusively on local needs while ignoring wider trends would 'condemn the regions to long-term decline', Mr Dorgan added.*
>
> *With the Republic's competitiveness severely eroded, the watchword for investment must be 'quality rather than quantity', he told the committee.*

> *Multinationals will be wooed by a flexible and innovative workforce, not by the rapidly diminished potential for cheap labour.*[51]

This controversial submission was to be the first major public criticism of the NSS in his stating that the 23 nominated growth settlements should, implicitly, be halved by not concentrating on the Hubs. It was articulated by a very influential public servant. Time wise, it was delivered some five months before the 2003 Budget Speech on decentralisation by the Minister for Finance. The strategy conflict is thus political versus pragmatism: one of concentration or dispersal.

[51] Furthermore, such fragile population limitations are accentuated by the near tundra-like densities of the surrounding countryside. The decision made in 2003 by eBay to eschew Athlone in favour of Dublin the *Irish Times* of 11th May 2004 Page 19 as reported by Jamie Smyth, at the opening of their Dublin office with 225 people. This has successively expanded to over one thousand jobs, augmented by the establishment of a customer service centre in Dublin together with an international headquarters for its payment subsidiary, PayPal.

Appendix 10: Population Projection Techniques (Morgenroth, 2001)

A9.1 Population Projection Techniques

First we define the following variables:

P_f = county population projection for the year f

P_a = county population at the start of the base (year a)

P_b = county population at the end of the base period (year b)

PS_f = state population projection for the year f

PS_a = state population at the start of the base (year a)

PS_b = state population at the end of the base period (year b)

x = number of years in the projection horizon

y = number of years in the base period

r = average annual growth rate during the base period.

The population projections methods are given by the three equations below.

Method 1 linear extrapolation (LINE)

$$P_f = P_b + \frac{x}{y}(P_b - P_a)$$

Method 2 exponential extrapolation (EXPO)

$$P_f = P_b \exp(rx)$$

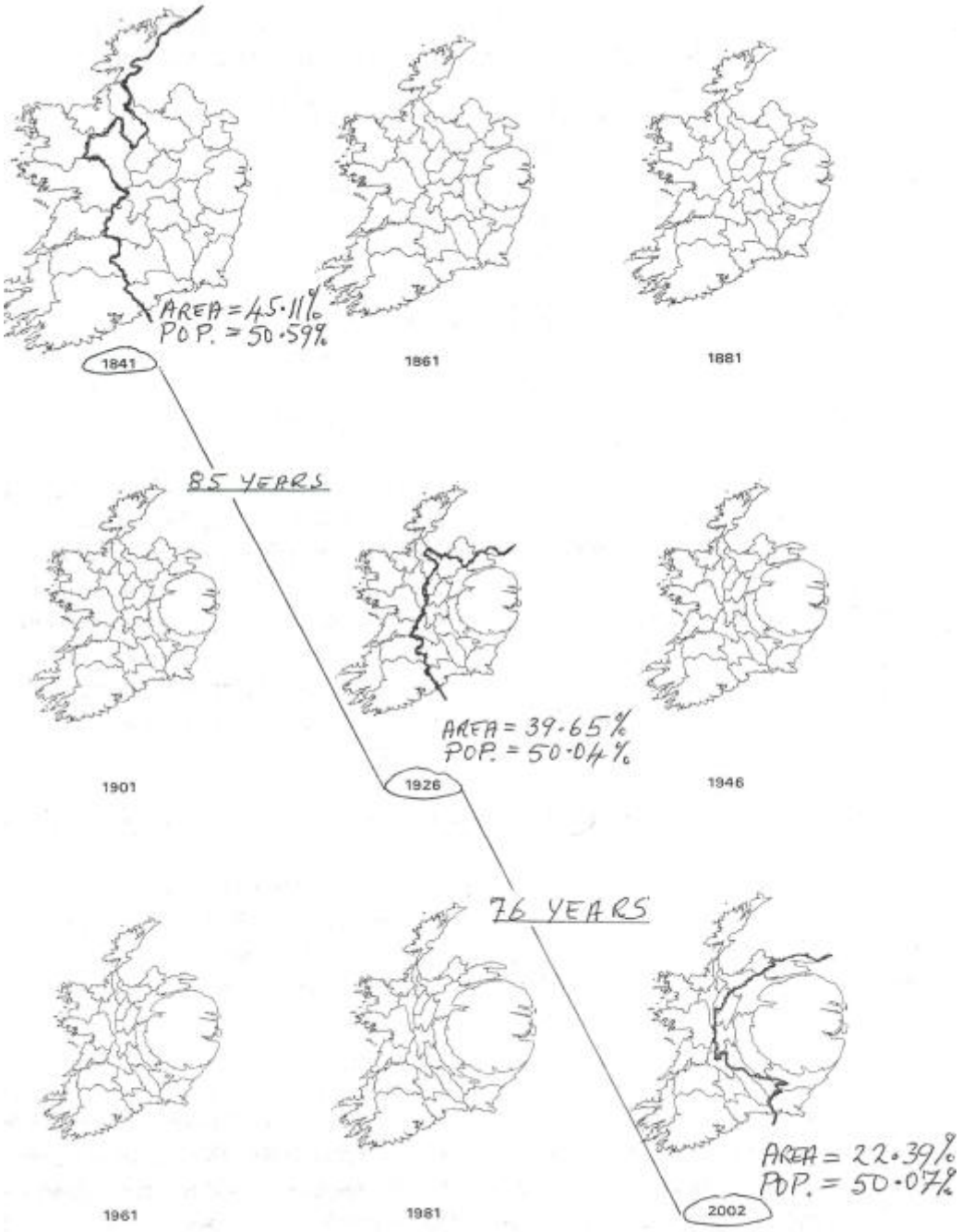
Method 3 shares of state population (SHARE)

$$P_f = PS_f \left[\frac{P_b}{PS_b} + \frac{x}{y}\left(\frac{P_b}{PS_b} - \frac{P_a}{PS_a} \right) \right]$$

Method 4 average of the above three methods (AVERAGE).

Note: Method 2, exponential extrapolation (EXPO) is the standard one used in thesis research.

Appendix 11: A Time-series Cartogram Analysis of the Eastern Share Drift of State Population: 1841-2002



Source: Thesis author's assessment of census populations and county surface areas for 1841, 1926 and 2002 as shown in Cartograms prepared by Martin Charlton in Gleeson, J, Kitchin, R. (2008).

Note: The Surface Area distortion of counties is population-driven and the respective sets of percentage outcomes as shown for population and surface areas relate to the eastern portions to the right-hand side of the black line. This Appendix 11 Figure gives a good appreciation of the thesis hypothesis time-dynamic wherein half of the Dublin-centric portion of the State's population is gradually being corralled, eastward of the black lines, into an increasingly tighter surface area that in time will equate to the GDA.

Appendix 12: Author's modification of O'Leary (2003 Scenarios

The O'Leary (2003) literature assists the research conclusion, that in the absence of a political will to recognise cities or to provide state-wide city-focused governance mechanisms, Dublin will continue to function as a highly monocentric settlement, and in doing so it will evolve from being a city region emerging as Ireland's city-state of the 21st century.

The two core-periphery scenarios as posited by O'Leary (2003) are extended (Fig. 8.2) to consideration of a third, lose-lose scenario informed by a zero-sum-game outcome. This is contrasted with author's fourth scenario, a win-win scenario (Fig. 6.3) driven by the expanding economic 'pie' of Pareto Optimality. Spatially, the third scenario results from a distributive-driven strategy in contrast with the fourth one which is dependent on implementing city-reinforced agglomeration, thereby driving national growth and competitiveness.

Appendix 12, Figure 1: Regional Growth Scenarios: Where 'Rich' Indicates GDA and 'Poor' is RoS

	'Rich' Regions	**'Poor' Regions**
1st Scenario (Lose-Win) Regional Convergence or Balanced Regional Development	Urban Diseconomies Dominate	Exploit Catch-Up potential
2nd Scenario (Win-Lose) Regional Divergence or Unbalanced Regional Development	Agglomeration Economies Dominate	Failure to Catch-up

This Source: O'Leary, E., *Irish Regional Development – A New Agenda* (2003: 30).

Note: Other nomenclature designations, respectively for 'Rich' and 'Poor' regions are 'Core' and 'Peripheral', as for example, when applied to the econometric "core-periphery equilibrium" sustainability model (Robert-Nicoud, 2006).

O'Leary points to possible combinations of above-table classifications, with other possible scenario outcomes.[52] Co-incidental to this research's early articulation of win-lose versus Pareto-optimality outcomes, posited in chapter one, *supra*; this logically introduces two additional but related scenarios.

One such challenge has already been posed by O'Leary (2002); to question the received wisdom, the central objective of the NSS: that of achieving BRD. That author is consistent with the demographic findings of thesis writer, in noting that for this State there are just two regions: the GDA and 'the rest'. Furthermore, there is the sustainable core/ peripheral regional equilibrium - how does it "nest" with BRD? Would the Dublin firm make the decision to set up a Cork branch if its profitability reinforces that city's primacy and thus impedes BRD? On the other hand, with the completion of the motorway to Cork in 2010, as funded by a higher economic 'order', does this represent a bifurcation-like occurrence? One that arose from the Dublin-led Celtic Tiger prosperity and thus enabled the deployment of funding for capital infrastructure, thereby substantially reducing that firm's transportation costs?[53]

Paradoxically, can Cork benefit from Dublin's theoretical, lower production costs and the peripheral region thus share in a 'win-win' measure? Recent NEG theory holds that the larger the core UA region, the better off is the Pareto-dominated dispersion (Hicks), and the more likely that Cork *also* will agglomerate; i.e. *the winner from agglomeration compensates the loser*, Robert-Nicoud (2009). It is noted that whereas the Kaldor 'Improvements Compensation' preposition is conditional regarding agglomeration, Hick's 'Social Criterion' always prefers agglomeration to dispersion (Robert-Nicoud, 2006: 119). Supporting Williamson's 'core-periphery hypothesis' (1975) there also is Bosker's (2007) explanation, as to the extent to which a core region's agglomeration might benefit a peripheral region, a function of the latter region's urbanisation.

[52] O'Leary advises that neither of his (1st or 2nd) scenarios *would deliver the greatest improvements in national growth and competitiveness. From a national perspective, the ideal outcome would be for agglomerate economics to dominate in the 'rich' regions and for the 'poor' regions to exploit their catch-up potential. If this is achieved, the result may be either balanced or unbalanced regional development, depending on the relative performance of 'rich' and 'poor' regions* (ibid. *p. 31).*

[53] Prior to the Celtic Tiger (1993-2007) period little money was available for major investment projects such as the nearly-complete inter-city motorway programme.

Pareto-like, the agglomeration momentum from core to periphery can make both regions better off when trade costs, resulting from sufficiently low scale economies, are passed on to both populations in the form of reduced prices. Agglomeration enhances product variety. In turn, this has a positive impact on consumer surplus both in the core and periphery. If linkages are strong, the impact is large which makes it economically easier to compensate the periphery - the more so, the lower the transport costs. Compensation is possible provided such transport costs are sufficiently low and the vertical linkages are sufficiently strong. *Winners can compensate losers and still be better off under agglomeration because product variety is larger under agglomeration than under dispersion. The larger the difference of product price variety the easier it is to compensate the losers resulting from agglomeration* (Robert-Nicoud, 2006).

This research posits two complementary scenarios using the O'Leary 'template' as shown herein, the first of which is unconscionable and is unduly pessimistic, especially in the wake of the Celtic Tiger period and yet, having regard to post-9/11 employment growth. Logically, however, it is a derivative of the pessimistic scenario as posited by O'Leary, thus:

Appendix 12, Figure 2: Regional Growth Scenarios: Where 'Core' Indicates GDA and 'Peripheral' is RoS

3rd Scenario (Lose-lose): Outcome	**'Core' Regions**	**'Peripheral' Regions**
Regional Divergence	Urban Diseconomies Dominate	Failure to Catch-Up
(part of 2nd Scenario)	(part of 1st Scenario)	(part of 2nd Scenario)

Source: Thesis author.

It is acknowledged that ongoing Irish governments' continuing pursuance of a *laissez-faire* approach to spatial planning or of a policy that is politically-driven inherently carry with them risks of the above, third 'lose-lose' scenario outcome, albeit up to mid-1997, masked by the favourable post-Celtic Tiger growth. In the longer time-frame, it has to be acknowledged that Ireland's past economy has performed indifferently. Prior to the unprecedented growth of the 1990s, little change had taken place in the number of people at work since the first post-independence census of 1926.

Despite the growth of the past fifteen years or so in the absence of cities and their associated urban agglomerative processes, it is very much open to doubt as to whether the current policy of BRD is sustainable, for the reasons adduced by O'Leary and additionally, by the author of this thesis. For particular mention is the fact that the NSS, singularly, has failed to acknowledge the emergence of the Polycentric Suburb as perhaps the most significant form of settlement-type in the hierarchy of Irish settlements, particularly since the start of the 1990s.

If Ireland is to adopt a similar policy strategy of concentrated spatial discretion, the 4th 'win-win' scenario, shown hereunder, is introduced by thesis-author, as the one that underpins and reinforces the philosophical basis of the subject thesis hypothesis.[54] Supporting this scenario is the recent literature by Robert-Nicoud (2006), which that author's introduction describes as being counter-intuitive as has already been emphasised hereinabove (*vide* Section 5.4).

Such articulation, based on extensive econometric analysis by that author, reinforces this research's counter-intuitive hypothesis that city-reinforced agglomeration, accompanied by effective strategic sympathetically-aligned public policy implementation, is the way for Ireland to proceed post-Celtic Tiger in implementation of spatial policy strategy. Applying the O'Leary formulation the resultant scenario is:

Regional Growth Scenarios: Where in the following Figure 'Core' Indicates GDA and 'Peripheral' is the RoS – Win-Win:

4th Scenario (Author's Pareto-optimality: win-win Hypothesis)

Appendix 12, Figure 3 Thesis Authors Win-Win Scenario

Outcome Win-Win	**'Core' Regions**	**'Peripheral' Regions**
Regional Divergence (***without*** BRD due to City-State)	Agglomeration Economies Dominate	Exploit Catch-up Potential

Source: Thesis author.

[54] The settlement growth-picture emerging from the Towns Analysis is robust confirmation of the spread effect from the core region arising from Dublin's UA.

The ‘national growth’ thinking behind this 4th Scenario is based on the optimistic premise that despite the current economic downturn, over the longer timeframe the State will continue to ‘grow’ significant net job-creation. Against this background however, individual regions will tend to exhibit greater growth variations with the more urbanised ones likely to fare best (Futures Academy, 2007). Emerging research on FDI location-preference, combined with lower levels of job losses in the GDA – detailed hereunder are cited in support of this view.

O’Leary (2003) further notes that *there is a distinct possibility that the objectives of BRD and improved national growth and competitiveness may not be simultaneously achievable*. Instead, that author states that both of these ‘incompatibles’ need to be replaced by one unifying strategic objective: namely, one *that combines national growth and competitiveness* – with a focus on FDI firms.

Appendix 13: Determinants that influence FDI Location decision-making

The enormous economic and finance pressures on the government to seek economies of scale, value for money and rationalisations, is evident in current decision-making. The resultant trend, in choices of location, both in their capital and current budget formulations is resulting in fewer centres of excellence, proposals to merge higher levels of local administration, down-grading and threatened hospital closures, deferment of public sector decentralisation, selection of major infrastructural projects associated with larger centres of population, *Irish Times*, 27th July 2010.

In the same manner, the issue of settlement scale size is critical to the decision-making of FDI strategists as to where to locate. Likewise, such decision-making is sensitively linked to the issue of productivity and competitiveness. Skehan (2007) has set out guidelines as to minimum settlement incorporated into a standardised computation observed by such companies. Their objective is to limit a one-journey commute to a maximum of 40 minutes, thereby ensuring that the worker arrives 'fresh'. The first following example is based on a labour-force requirement for a Global Plant operation. The purpose of the task is to assess a settlement minimum size in respect of a global-sized operation which, together with contract employees, requires say 10,000 workers. An Irish example might be that of Intel, thus:

Settlement Type 1: For a 'global operation' FDI:	
Employees:	10,000
Turnover – churn:	30,000
Specialisation of labour pool	150,000
Labour force to population	300,000

Source: Skehan (2007)

Discussion: This is a four-stage assessment of required settlement size. The turnover-churn factor is critical to an employer's flexibility over an indefinite time-frame of the plant's existence in a fixed location. The sought specialisation of skill-sets and accessible education facilities, coupled with employee experience sets a guideline of one-in-five of the available labour pool. Finally, in the 2006 census, there was approximate a two-to-one ratio of workforce to population.

Conclusion: This constrains for Settlement 1 operation confines the Irish choice of location to Dublin only. In doing so, it draws attention to the absence of a middle tier of settlement in the 250,000 to 500,000 population category.[55]

Settlement Type 2: For a major FDI operation:

This time the target is a 5,000 plant, including contract workers.

Using the same criteria as in Type 1, here the minimum settlement size requirement is for 150,000, half that of the first example. Based on similar criteria the location is again Dublin with Cork as the sole alternative choice based on current population.

Discussion: With the near demise of the Fordist-type branch plant operation for manufacturing together with the fact that more modern industrial operations now have significant cerebral content, the prospects of obtaining such employment for medium or even large towns in the Irish context is both remote and is diminishing all the time. Accordingly, Markusian-type industrial clustering, which allow for information spill-over and a choice of skilled labour force, make the objective of industrial agglomeration one that has to be focused on settlements of minimum threshold size.

That is unless such town-location, as in the above case of Intel in Leixlip, being a large town settlement which is firmly within the sphere of influence of western Dublin. Today, spatial economic theory has developed a long way from von Thunen or even Alonso's empirical identification of transport costs as a pivotal location-determinant.

[55]Nearly twenty years ago, Dell decided not to establish a second 3,000 worker production plant in Limerick, because of its limited population size, despite it being Ireland's third largest settlement.

However, this still leaves the peripheral region with its employment disadvantage. The question is how to create a happy medium for both core and periphery and in this, NESC 117 (2008) suggests combining both *distributive* with *constitutive* processes in discarding past practices. This is to the core of questioning the legitimacy of adopting BRD as a lead-principle of the NSS. Breathnach (2007: 16) describes the historic IDA's implementation of an extreme form of industrial dispersal in their 1970s Regional Industrial Plan, despite the IDA's apparent ability to be able to 'parachute' Fordist branch plants *into any given part of the country almost at will,* as explained by McMenamin to thesis author. Ominously, due to the absence of clustering or the existence of economies of scale, this proved to be an expensive and disastrous strategy failure. It remains today as a stark reminder to those who would still advocate policies of dispersal. Thus it is all the more disturbing to note the clear policy divergence that still exists, as between the IDA and Enterprise Ireland and likewise, government's contradictory explanations of their Decentralisation programme regarding non-espousal of the NSS (Breathnach, *op. cit.*).[56]

Effectively, little progress had been achieved in population size convergence: the other cities substantially, having failed to realise the population targets that Buchanan had set for the period to 1986. By inference, their 2006 levels had made no meaningful change in aggregate city growth over the previous forty years. Cork moved from 12.86% to 13.14%, Limerick, from 5.96% to 6.27% and Waterford from 3.06% to 3.40%. As the one exception, Galway's share of aggregate city population grew from 2.70% to 5.02%.

In aggregate, the embryo cities share of total city population grew from 24.58% to 27.83% in 1996-2006. If government strategic policy fails to recognise the potential for one or more of these cities to eventually agglomerate, they could continue to stagnate in terms of State population share: at 8.30% share in 1966 and at 9.51% share in 2006. Likewise, contiguous Dublin's share of 25.48% contracted to 24.67% over that period.

[56] Also arising from conversations with interviewees is the issue of rationalising not only the IDA and Enterprise Ireland but likewise similar-functioning agencies including Udaras na Gaeltachta, Shannon Development, FÁS, Forbairt and Forfás, all of which *inter alia* provide industrial expertise either locally or State-wise.

These differences tend to mask a substantial divergence of growth as between the individual embryo cities over the 40-year timeframe to 2006 with Galway performing strongly compared with the three other embryo cities. For example, Cork, Limerick and Waterford's aggregate population growth in the period 1986-2002 at 28,241, was only modestly greater than Galway's population increase of 19,059 over that period. In the earlier 20 year period the respective figures were 78,525 for the three cities as against 20,809 for Galway.

Most notably Cork, which had grown by 48,826 in the 20 years to 1986, was subsequently characterised by a sharp slow-down that added only 16,275 to its population in the latter 20-year period to 2006. In such analysis however, changes are made over time to 'Administrative and Census Areas' as noted in Appendix 2, Volume 1 of the 2002 Census. *The boundaries of the Cities are subject to periodic extensions to keep pace with building development and it is not possible, therefore, to show comparable retrospective population figures over an extended period* (ibid. p. 161).

Accordingly, the above figures need to be viewed with some caution. When regular updating is introduced, for the establishment of standardised FUR measurements, specific population density analysis will be facilitated to take account of geographical spread, particularly having regard to the growth of towns that are within the commuting belts of all cities. This issue is of particular importance in terms of urban economic analysis since the days of Buchanan. In the intervening 40 years, monocentric form has mostly given way to polycentric city form and accordingly the rigidity and limitation imposed in the comparison of city size, by way of Central Place or Rank Size theories alone, inadequately reflect the measured ways in which larger Irish settlements have grown.

Appendix 14: Evidence of Recent Population Deflection from Dublin

The Table herein, confirms that between 1996 and 2006 Dublin's 12.18% growth is less than one-third that of the Mid-East counties, one that ought to be of particular concern from a policy perspective. Likewise it represented just 71.94% of the 16.93% national average growth over that decade. At the Dublin administrative county level it is magnified in the extent of population deflection from Dun Laoghaire-Rathdown and South Dublin at 63.54% and 14.02% of their respective natural growth, as detailed in the following Table Appendix 14.1. This was largely attributed to under-provision of housing up to 2006 and to consequent unaffordable market values in Dublin (Williams, Hughes, and Shiels, 2007).

That significant under-provision of housing in the capital occurred during the strongest period of economic growth (1993-2006). In turn, this resulted in an unsustainable population deflection, most notably from Dun Laoghaire-Rathdown (DLR) and South Dublin, as shown in Appendix Table 1, hereunder. These data for out-migration, identifies in bold detail the county origins of population deflection and the disparity in the two population growth components, within the GDA in intercensal 1996-2006.

Appendix 14, Table 1: GDA Population Growth Components: 1996-2006

County	Natural Growth	In-migration	Total Growth	Deflection % (*where* negative)
South Dublin	32,805	**-4,598**	28,207	**(14.02)**
Fingal	27,261	45,048	72,309	
Dublin City	21,439	2,918	24,357	
Kildare	20,873	30,470	51,343	
Meath	13,759	39,340	53,099	
DunLaoghaire-Rathdown	11,079	**-7,040**	4,039	**(63.54)**
Wicklow	9,889	13,622	23,511	
Total	**137,105**	**119,760**	**256,865**	

Source: Author's analysis of CSO's 2002 and 2006 Censuses, Vols. 1, Table 1 and Vol. 4, Table 2

The restraint in new-housing under-provision has had profound social consequences, with the consequent enforced population deflection from Dublin generating increased volumes of unsustainable long-distance commuting to the mid-east counties, outer Leinster and to south-east Ulster.[57]

In turn, this deflection has artificially boosted the populations of the receiving towns, resulting in the levels of growth particularly into the Mid-East region. However, as such towns now have a large dormitory population most of whom don't work locally, their population growth has questionable value. As confirmed by Stafford, et al. in Hall and Pain (2005) their share of APC-type employment remains weak and consequently their ability to generate agglomerative growth is overestimated.

[57] The specific case of DLR and its emerging housing shortage and of its consequent population deflection was first identified in DIT-SCS Study prepared for the four Dublin local authorities (Williams, Shiels and Hughes, 2002).